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Revision of Old World species of the genus *Aplectana* Railliet & Henry, 1916 (Nematoda, Cosmocercidae)

by Michael R. Baker *

Abstract. — The generic diagnosis of *Aplectana* is emended, *Aplecturis* Skrjabin, Schikhobalova & Mozgovoi, 1951, *Freitasoxyascaris* Gomes & Motta, 1967, and *Stewartia* Rao, 1977, are shown to be synonymous with *Aplectana*. *Aplectana* spp. in the Old World are revised and redescriptions of the following species are given : *A. acuminata* (Schrank), *A. brumpti* Travassos, *A. chamaeleonis* (Baylis), *A. courdurieri* Chabaud & Brygoo, *A. hylambatis* (Baylis), *A. leesi* Hristovski & Riggio, *A. linstowi* Yorke & Maplestone, *A. macintoshii* (Stewart). *A. brygooi* n. sp. from frogs of Madagascar is described. *Oxysoma perezi* Gendre is a *species inguirenda*. *A. praeputialis* (Skrjabin), *A. ranae* (Walton, 1931) n. comb., and *A. vercammeni* Le Van Hoa are considered to be valid species. All other species from the Old World are either excluded from the genus or synonymized with various *Aplectana* spp. New World species are reviewed and 21 species are considered as valid. *Aplectana crossodactyli* nom. nov. is proposed for *Neyraplectana travassosi* Vicente & Santos, 1970 [nec *A. travassosi* (Gomes & Motta, 1967)]. The generic position of *A. cubana* Baruš (males unknown), *A. incerta* Caballero and *A. pintoi* Travassos (females unknown) is unclear and they are left *incertae sedis*. *Aplectana foecunda* (Rudolphi), *A. unguiculata* (Rudolphi), *A. dubia* (Leidy), *A. congolense* Schuurmans Stekhoven, *A. fusiforme* Savazzini, *A. mauritanica* López-Neyra are *species dubia*. *Aplectana americana* Walton is synonymized with *Cosmocercoides dukae* (Holl). *A. lynae* Kennedy is shown to belong to *Cosmocercoides*; it is probably synonymous with *C. dukae*. A key to *Aplectana* spp. is given.

Résumé. — *Révision des espèces du Vieux Monde du genre* Aplectana *Railliet & Henry, 1916 (Nematoda , Cosmocercidae).* — La définition d'*Aplectana* est amendée. *Aplecturis* Skrjabin, Schikhobalova & Mozgovoi, 1951, *Freitasoxyascaris* Gomes & Motta, 1967, et *Stewartia* Rao, 1977, sont synonymes d'*Aplectana*. Les espèces d'*Aplectana* du Vieux Monde sont passées en revue et des redescriptions des espèces suivantes sont données : *A. acuminata* (Schrank), *A. brumpti* Travassos, *A. chamaeleonis* (Baylis), *A. courdurieri* Chabaud & Brygoo, *A. hylambatis* (Baylis), *A. leesi* Hristovski & Riggio, *A. linstowi* Yorke & Maplestone, *A. macintoshii* (Stewart). *A. brygooi* n. sp., parasite chez les grenouilles malgaches, est décrit. *Oxysoma perezi* Gendre est considérée comme *species inguirenda*. *A. praeputialis* (Skrjabin), *A. ranae* (Walton, 1931) n. comb. et *A. vercammeni* Le Van Hoa sont des espèces valides. Toutes les autres espèces du Vieux Monde sont soit synonymes d'*Aplectana* spp., soit exclues d'*Aplectana*. Les espèces du Nouveau Monde sont révisées et 21 espèces sont valides. *Aplectana crossodactyli* nom. nov. est proposé pour *Neyraplectana travassosi* Vicente & Santos, 1970 [nec *A. travassosi* (Gomes & Motta, 1967)]. Trois espèces, *A. cubana* Baruš (mâles inconnus), *A. incerta* Caballero et *A. pintoi* Travassos (femelles inconnues) sont des espèces *incertae sedis*. *Aplectana foecunda* (Rudolphi), *A. unguiculata* (Rudolphi). *A. dubia* (Leydi), *A. congolense* Schuurmans Stekhoven, *A. fusiforme* Savazzini, *A. mauritanica* López-Neyra sont des *species dubia*. *Aplectana americana* Walton est un synonyme de *Cosmocercoides dukae* (Holl). *A. lynae* Kennedy est un *Cosmocercoides* sp., probablement un synonyme de *C. dukae*. Une clé des espèces d'*Aplectana* est donnée.

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In a preceeding article (Baker, 1980) the genus *Oxysomatium* of the Subfamily Cosmocercinae was revised. In the present study *Aplectana* is reviewed. Old World species have been examined in detail and redescriptions are given of all species for which specimens are available. New World species are reviewed briefly, and a key to species is presented.

Materials and methods

Specimens were borrowed from various institutions. The same abbreviations used in Baker (1980) are used herein. A number of host records appearing in the literature are of doubtful status because of problems in amphibian taxonomy. These are indicated in the lists of hosts by placing the species epithet in quotation marks. Certain " species " such as *Bufo* " *regularis* " include a complex of several morphologically indistinguishable species. *Rana* " *esculenta* " is now known to be a hybrid of *R. ridibunda* X *R. lessonae*.

RESULTS

The genus *Aplecta* was proposed by Railliet & Henry (1916*a*) with *Ascaris acuminata* Schrank, 1788, as type species. Railliet & Henry (1916*b*) observed that the name *Aplecta* was preoccupied and they proposed the replacement name *Aplectana*.

Synonymy

Aplecta Railliet & Henry, 1916 (preoccupied).
Neoraillietnema Ballesteros-Márquez, 1945.
Neyraplectana Ballesteros-Márquez, 1945.
Aplecturis Skrjabin, Schikhobalova & Mozgovoi, 1951.
Neoxysomatoides Yamaguti, 1961.
Freitasoxyascaris Gomes & Motta, 1967.
Stewartia Rao, 1977.

Emended diagnosis of *Aplectana* : Cosmocercinae sensu Chabaud, 1978, Cosmocercidae, Cosmocercoidea, Ascaridida. Tail of male lacking rosettes or plectanes. Somatic papillae and lateral alae present. Numerous thin-shelled, small eggs in uteri. Both ovaries anterior to vulva.

Type species : *Aplectana acuminata* (Schrank, 1788) Railliet & Henry, 1916.

Aplectana most closely resembles *Oxysomatium*. These genera may be differentiated by the location of the two ovaries : in *Aplectana* both are anterior to the vulva whereas in *Oxysomatium* one is anterior to and the other is posterior to the vulva.

Ballesteros-Márquez (1945) proposed two new genera. *Neoraillietnema* Ballesteros-Márquez, 1945, with the single species *Oxyuris praeputialis* Skrjabin, 1916, was distinguished from other genera in the subfamily on the basis that the type species is " amphidelphic " (i.e. ovaries on either side of the vulva), and that the few eggs present in females are arranged in a straight row in each uterus. In fact in this species both ovaries are anterior to the vulva and there are numerous eggs which are not arranged as indicated by Ballesteros-Márquez (see Le Van Hoa, 1962). Chabaud (1978) synonymized

Neoraillietnema with *Aplectana* and the present study supports his revision. *Neyraplectana* Ballesteros-Márquez, 1945, was proposed for *Aplectana* spp. lacking a gubernaculum. In *Aplectana* this structure may vary from being small and inconspicuously chitinized (i.e. *A. macintoshii*) to relatively large (i.e. *A. hylambatis*). All species examined herein possess at least a minute gubernaculum. The trend towards reduction in size of the gubernaculum is gradual in the Cosmocercinae and the presence or absence of this structure cannot be considered a valid generic character. *Neyraplectana* is a synonym of *Aplectana* as suggested by Chabaud (1978).

Neoxysomatoides Yamaguti, 1961, with the single species *N. mexicanum* (Caballero, 1933) was synonymized with *Aplectana* by Chabaud (1978).

Aplecturis Skrjabin, Schikhobalova & Mozgovoi, 1951, with the single species *A. hamatospicula* (Walton, 1940) belongs in the Cosmocercinae rather than the Atractidae where it was originally classified (Chabaud, 1978). Chabaud (1978) indicated that this genus is probably synonymous with *Oxysomatium* or *Aplectana* but that because the female reproductive system had not been described, it is not clear to which of these genera the type species should be referred. Specimens of *A. hamatospicula* which were identified by Walton were examined in the present study and *Aplecturis* is designated a synonym of *Aplectana*.

Chabaud (1978) suggested that *Freitasoxyascaris*, containing the single species *F. travassosi* Gomes & Motta, 1967, may be synonymous with *Aplectana*. Type specimens were examined in the present study and this synonymy is confirmed.

Rao (1977) proposed *Aplectana macintoshii* (Stewart, 1914), as type species of a new genus, *Stewartia*. According to Rao, *Stewartia* has rosette papillae lacking plectanes. However rosette papillae are in fact not present on the type specimens of *A. macintoshii*, and *Stewartia* is synonymized with *Aplectana*. Rao's specimens were probably referrable to the genus *Cosmocercoides*. *Stewartia chabaudi* Rao, 1977, host unknown, is a *species dubia*.

Old World species

1. **Aplectana acuminata** (Schrank, 1788) Railliet & Henry, 1916

Ascaris acuminata Schrank, 1788, after Goeze, 1782.
Fusaria acuminata (Schrank, 1788) Zeder, 1803.
Oxyuris acuminata (Schrank, 1788) Mayer, 1841.
Heteracis acuminata (Schrank, 1788) Diesing, 1861, nec Dujardin, 1845.
Cosmocerca commutata (Dujardin, 1845) sensu Drasche, 1882 in part.
Heterakis acuminata (Schrank, 1788) Stewart, 1914.
Aplecta acuminata (Schrank, 1788) Railliet & Henry, 1916.
Oxysomatium acuminatum (Schrank, 1788) Skrjabin, Schikhobalova & Mozgovoi, 1951.
? *Aplectana multipapillosa* Ivanitzky, 1940.
? *Oxysomatium multipapillosum* (Ivanitzky, 1940) Skrjabin, Schikhobalova & Mozgovoi, 1951.
? *Oxysomatium srinagarensis* Fotedar, 1960.
? *Aplectana caucasica* Sharpilo, 1978.
? *Spinicauda mathevossianae* Skarbilovich, 1950.
nec *Aplectana acuminata* sensu Hartwich, 1975 (see *A. macintoshii*).

Redescription (fig. 1)

Lateral alae present, 20 µm wide at mid-body. Numerous minute somatic papillae present. Oral opening triangular, large. Lips large. Cephalic extremity with two large subdorsal and two large subventral cephalic papillae. Amphids small. Anterior extremity in some specimens retracted into body. Anterior extremity of oesophagus divided into three blunt projections covered by a prominent thick ring of cuticle. Pharyngeal portion of oesophagus relatively short.

Male (5 specimens) : Total length 4.0-4.8 mm. Oesophagus 505-665 µm long. Nerve ring 205-340 µm and excretory pore 270-330 µm from anterior extremity. Tail 280-325 µm long, conical. Numerous caudal papillae present, variable in number and distribution. Caudal papillae cannot be distinguished from the numerous somatic papillae. Anterior lip of cloaca prominent, with one small papilla. Preanal region with two rows of papillae which are relatively large and surrounded by a ring of minute punctations. Spicules 295-383 µm long, distal extremity sharply pointed. Gubernaculum 89-118 µm long, well chitinized.

Female : See Discussion.

Specimens examined : Frandsen personal collection Bca 21 (from *Bufo calamita* of Denmark). Type specimens are not available.

Locality : There is no type locality. This species has been widely reported in Western Europe and as far to the east as the Caspian Sea, and south in Egypt and Yemen. It may have been confused with other *Aplectana* spp. from Europe, and thus many literature reports are not reliable. Reports which can be identified as *A. acuminata* from descriptions provided are the following : Germany (Drasche, 1882 ; Travassos, 1931*b*), Kashmir (Fotedar, 1960), Ukraine (Ivanitzky, 1940), Caucasus (Sharpilo, 1978) Spain (López-Neyra, 1947), Denmark (present study).

Hosts : Hosts which could not be confirmed are indicated by a question mark. *Rana temporaria*, *R. arvalis* (?), *R. cyanophlyctis* (?), *R. dalmatina* (?), *R.* " *esculenta* ", *R. mascareniensis* (?), *R. ridibunda*, *Bufo bufo*, *B. calamita* Laurenti, *B. orientalis* (?), *R.* " *regularis* " (?), *B. viridis*, *Rombina bombina*, *B. variegata* (?), *Hyla arborea* (?), *Pelobates fuscus* (?), *Salamandra salamandra* (?), *Triturus vulgaris* (?), *Mertensiella caucasica*, *Anguis fragilis* (?), *Scincus hemprichi* (?).

Discussion

In 1782, Goeze published a brief description of a worm from *Rana temporaria* of northwest Europe which Schrank (1788) used as the basis for proposal of *Ascaris acuminata*. This name has been given in all major studies of the Cosmocercidae as a synonym of *Aplectana acuminata*. Unfortunately Goeze's description is insufficient to distinguish this species from other cosmocercoids (including *Cosmocerca* spp.) which are common in amphibians of Europe.

Travassos (1931*a*, *b*) added two new species, namely *A. schneideri* (herein synonymized with *A. macintoshii*) and *A. brumpti*, to the cosmocercoids reported from northwest Europe. He also published a redescription of *A. acuminata*. This work clearly demonstrated the distinctness of these three congeneric species, but unfortunately differ-

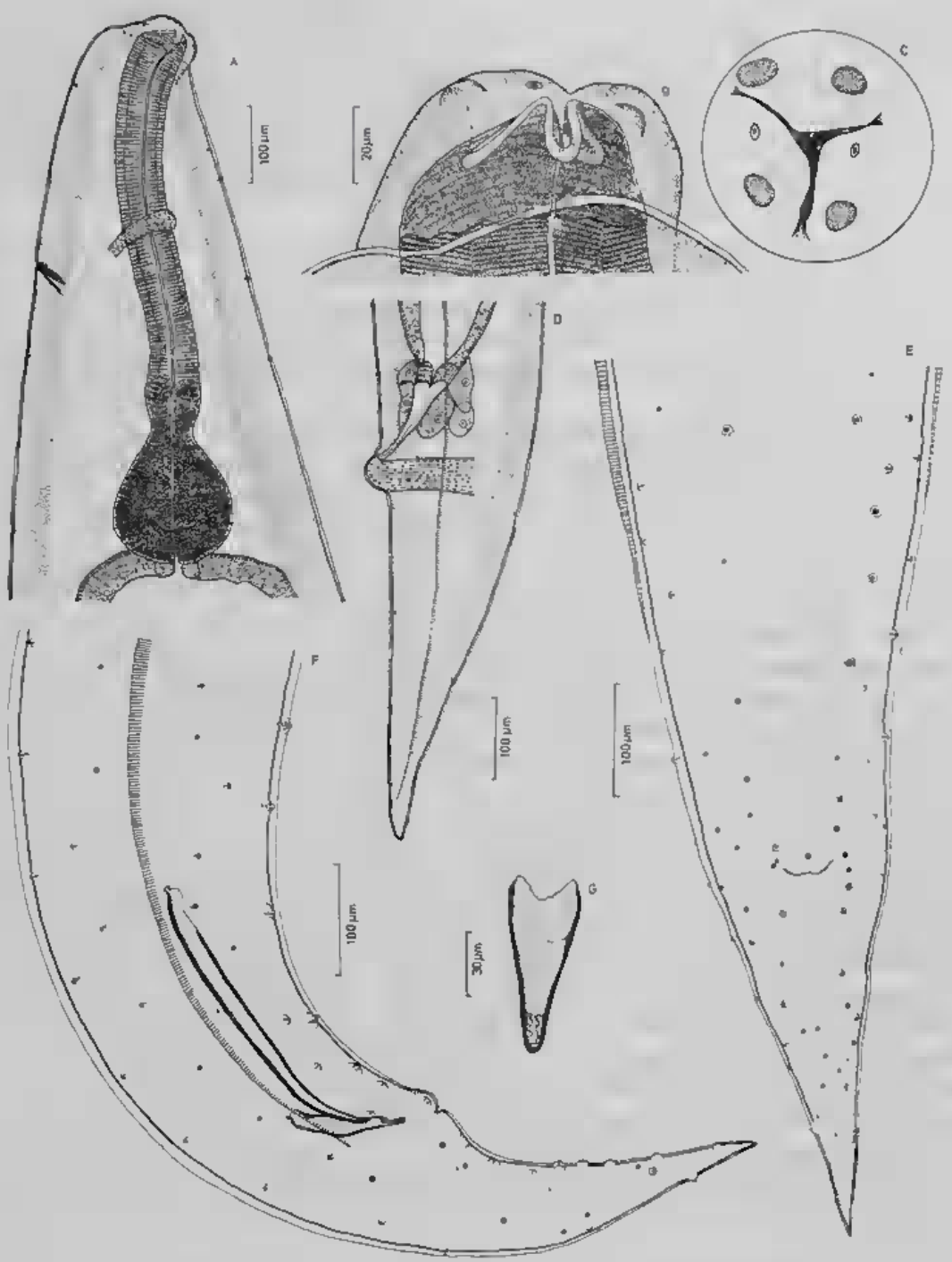

Fig. 1. — *Aplectana acuminata* (Schrank, 1788) Railliet & Henry, 1916 : A, anterior end, lateral view ; B, C, anterior extremity, lateral and apical view ; D, tail of female (see Discussion), lateral view ; E, F, caudal end of male, ventral and lateral view ; G, gubernaculum, dorsal view.

ential diagnoses were not given and type specimens to the new species were not designated. Thus the relation of Goeze's and Schrank's observations to the newly recognized diversity of *Aplectana* spp. of north-west Europe was not considered. This has led to confusion. The present study confirms the distinctness of the species described by Travassos under the names *A. acuminata*, *A. brumpti* and *A. schneideri*. Although *Ascaris acuminata* Schrank cannot be clearly identified, retention of the name *Aplectana acuminata* (Schrank) sensu Travassos, 1931*b*, will stabilize the nomenclature of the species group and preserve the much published name *Aplectana*.

In several early taxonomic studies of the Cosmocercidae the following names have been listed as synonyms of *A. acuminata* : *Ascaris subulata* Goeze, 1782 ; *Ascaris bufonis* Goeze, 1782 ; *Ascaris ani* Schrank, 1788 ; *Ascaris salamandrae* Schrank, 1790 ; *Ascaris salamandrae-terrestris* Rudolphi, 1809 ; *Ascaris ranae* Gmelin, 1790. These names have not been included in the list of synonyms given herein because the original descriptions do not permit identification.

Aplectana acuminata most closely resembles *A. macintoshii* among species reported from Europe. It may be easily differentiated from this species in that the gubernaculum is longer and more heavily chitinized, the male tail is relatively thicker, the female tail tapers gradually to a relatively blunt point rather than ending in a spike-like projection, and the cephalic end is different. Also there are prominent bands of muscles associated with the cephalic end of *A. macintoshii* which are inconspicuous in *A. acuminata*.

Although the males are morphologically quite different, females of *A. acuminata* and *Cosmocerca commutata* (Diesing, 1851) are morphologically indistinguishable. They differ from other cosmocercoids of Europe in the marked thickness of the tail (fig. 1D). Material studied herein included 21 female worms from one toad which also contained 13 male *A. acuminata* and 18 male *C. commutata* (Frandsen, *personal communication*). No morphological differences were observed in the female worms although this material almost certainly contains females of both species. This suggests a close evolutionary relationship in which conspicuous changes in the caudal morphology of males has not been matched by morphological changes in females. It should be noted that both species commonly occur together in the same host (see Travassos, 1931*b* ; Drasche, 1882 ; López-Neyra, 1947). A detailed redescription of female worms has not been given herein. In all female worms examined both ovaries are anterior to the vulva. Travassos (1931*b*) clearly illustrated this for female worms he identified as *A. acuminata*.

Type specimens of *Oxysomatium srinagarensis* Fotedar, 1960, from *Bufo viridis* of Kashmir, India, *Aplectana multipapillosa* Ivanitzky, 1940, from *Bufo* spp. and *Rana ridibunda* of the Ukraine, and *Aplectana caucasica* Sharpilo, 1978, from *Mertensiella caucasica* of the Caucasus, could not be obtained for study. However all three descriptions showed a male tail which is robust and with numerous small papillae distributed similarly to that observed in *A. acuminata*. *O. srinagarensis* and *A. multipapillosa* were reported from amphibians known to be suitable hosts to *A. acuminata*. *A. caucasica* was reported in a salamander apparently restricted in its distribution to the Caucasus. However, since *A. acuminata* has a wide host range including salamanders, its presence in this host is not unexpected. Both *A. multipapillosa* and *A. caucasica* were reported from areas well within the geographical range of *A. acuminata*. Although the type locality for *O. srinagarensis* is far to the east of other reports of *A. acuminata*, its type host, *B. viridis*, is commonly

infected with *A. acuminata* in western Europe. Kashmir lies between the Palaearctic and Tropical zoogeographical zones and it is near the limit of distribution of *B. viridis*, a Palaearctic amphibian. Parasites of amphibians occurring between the Middle East and Himalaya Mountains are poorly known and *A. acuminata* probably has a wider distribution in Eurasia than present records suggest. *O. srinagarensis*, *A. multipapillosa* and *A. caucasica* are provisionally synonymized with *A. acuminata*.

Baker & Bain (1980) have observed that *Spinicauda mathevossianae* Skarbilovich, 1950, from *Rana* and *Bufo* of Russia is probably synonymous with *A. acuminata*.

2. **Aplectana brumpti** Travassos, 1931

Oxysomatium brumpti (Travassos, 1931) Skrjabin, Schikhobalova & Mozgovoi, 1951.
? *Aplectana corti* López-Neyra, 1947.
? *Oxysomatium corti* (López-Neyra, 1947) Brenes & Bravo Hollis, 1959.
? *Aplectana miranda* Ivanitzky, 1940.
? *Oxysomatium miranda* (Ivanitzky, 1940) Skrjabin, Schikhobalova & Mozgovoi, 1951.
? *Aplectana ivanitzkyi* Markov, Khonyakina & Grigor'eva, 1972.
Aplectana itzocanensis Bravo Hollis, 1943 sensu Kozak, 1969.
nec *Aplectana brumpti* sensu Frandsen (see *A. linstowi*).

Redescription (fig. 2)

Lateral alae narrow, extending from anterior end to tail. Numerous small somatic papillae present. Oral opening triangular, three lips present. Cephalic extremity with six minute lahial papillae and six outer papillae of which the submedian pair is much smaller than the ventro-lateral and dorsolateral papillae. Amphids large. Anterior extremity of oesophagus with three tooth-like projections covered with thick cuticle.

Male (1 specimen) : Total length 2.5 mm. Oesophagus 570 µm long. Nerve ring 212 µm and excretory pore 407 µm from anterior extremity. Tail 205 µm long, slender, sharply pointed, with slight depression on ventral surface just posterior to the anus. Numerous papillae on caudal end. Only those papillae distinguished hy their large size are referred to as caudal papillae. Preanal region with two subventral rows of 9-12 pairs of large caudal papillae which become progressively smaller and less conspicuous anteriorly, finally becoming indistinguishable from somatic papillae. Anterior lip of anus with three pairs and one unpaired caudal papillae. One large pair of lateral caudal papillae present at level of anus. Mid-region of tail with two pairs of large subventral caudal papillae located close together. One suhdorsal pair of eaudal papillae located two-thirds of distance from the anus to the end of the tail. Terminal portion of tail with two pairs of caudal papillae located close together. Spicules prominent, 205 µm long, with blunt capitulum and sharply pointed distal extremity. Distal portion of spicules with rounded ventrally directed transparent membrane. Gubernaculum 77 µm long, maximum width 16 µm, weakly chitinized.

Female (2 specimens) : Total length 2.9-3.4 mm. Oesophagus 570-576 µm long. Nerve ring 216-240 µm, excretory pore 384-399 µm and vulva 1.9-2.2 mm from anterior extremity. Both ovaries located anterior to vulva. Tail 238-270 µm long, conical and sharply pointed. Eggs oval, 97-140 µm long, 50-66 µm wide.

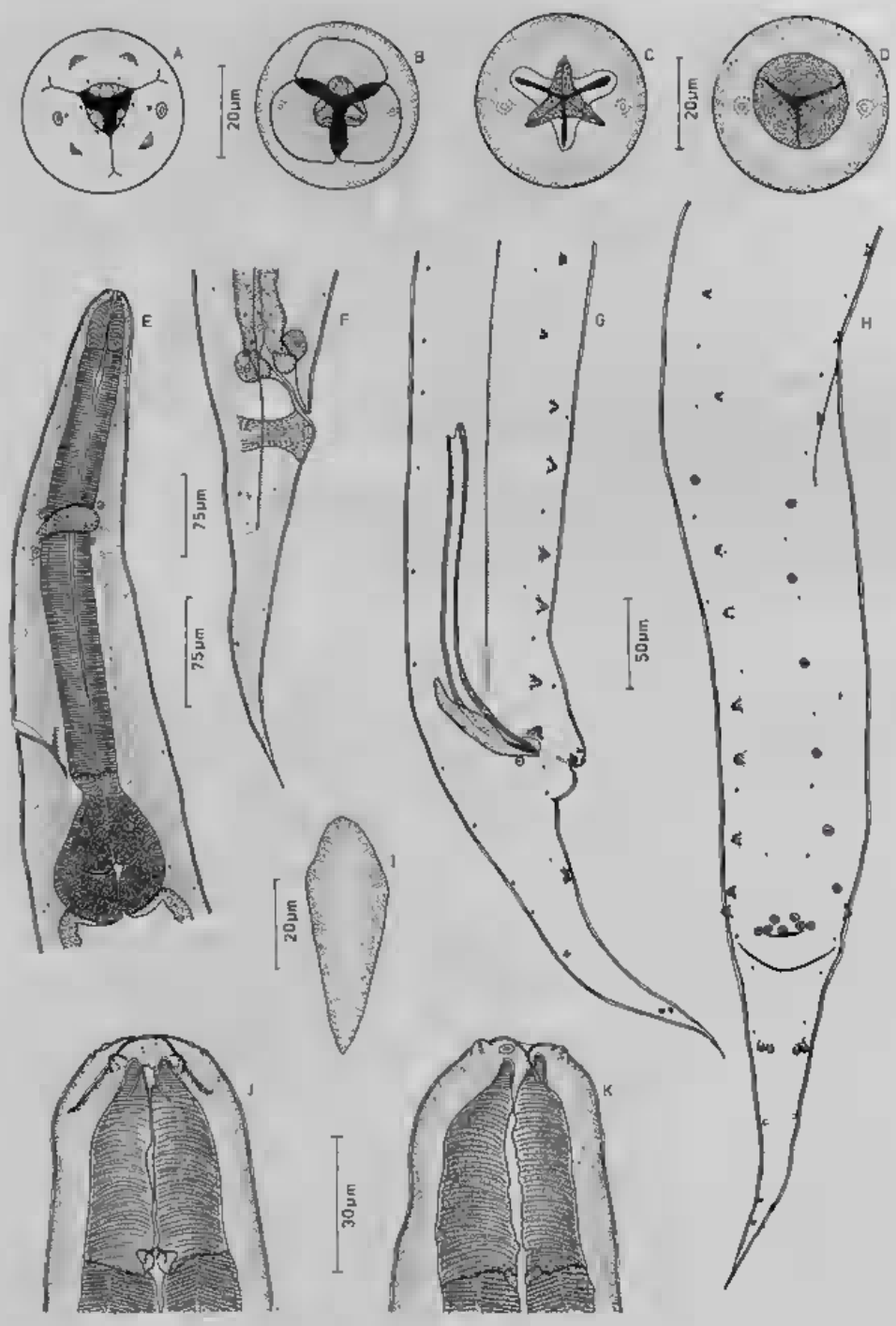

FIG. 2. — *Aplectana brumpti* Travassos, 1931 : A, anterior extremity, apical view ; B, *idem*, optical section through lips ; C, *idem*, section at base of lips ; D, *idem*, section through anterior end of œsophagus ; E, anterior end, lateral view ; F, tail of female, lateral view ; G, H, caudal end of male, lateral and ventral view ; I, gubernaculum, dorsal view ; J, K, anterior extremity, dorsal and lateral view.

Specimens examined : CIH 1977 (from *B. viridis*, London Zoo). Type specimens are not available for study.

Locality : The type locality is Corsica. This species has also been reported from the Ukraine (Ivanitzky, 1940 ; Shevchenko, 1966), Dagestan, USSR (Markov *et al.*, 1972), Turkey (Schad *et al.*, 1960), Czechoslovakia and Poland (Kozlowska, 1960 ; Kozak, 1969), Spain (López-Neyra, 1947).

Hosts : *Bufo viridis* Laurenti, *B. bufo*, *Rana temporaria*, *R. ridibunda*, *Pelobates syriacus*, *Natrix natrix*, *N. tessellata*.

Discussion

A. brumpti most closely resembles *A. itzocanensis* Bravo Hollis, 1943, and *A. hoffmani* Bravo Hollis, 1943, from Mexican amphibians, in the distribution of caudal papillae and the appearance of the spicules and gubernaculum in males. However, *A. itzocanensis* and *A. hoffmani* have a single pair of large postanal papillae on the first quarter of the tail which is lacking in *A. brumpti*. Kozak (1969) described eosmocercoids from European amphibians under the name *A. itzocanensis*. Although the description of these worms is incomplete they are herein referred to *A. brumpti*.

A. corti López-Neyra, 1947, from *B. viridis* of Spain, *A. miranda* Ivanitzky, 1940, from *Rana temporaria* and *R. ridibunda* of the Ukraine, and *A. ivanitzky* Markov, Khonyakina & Grigor'eva, 1972, from *Natrix natrix* and *N. tessellata* of Dagestan, USSR, are provisionally designated synonyms of *A. brumpti*. Type specimens are not available for study but each of the descriptions gives sufficient details for identification. A characteristic rounded ventral membrane on the distal extremity of the spicules, the presence often of a ventral groove or depression of variable size in the region of the anus and anterior portion of the male tail, and the distribution of papillae on the caudal end of males, easily distinguish this species from all others reported from Europe. The depression on the male tail, which is a fixation artifact, was large in the specimen illustrated by Kozlowska (1960), somewhat smaller in that examined by López-Neyra (1947) and Markov *et al.* (1972), and reduced to a narrow groove in the male worms examined in the present study. Ivanitzky (1940) mentioned a depression on the male tail of *A. miranda* but he did not illustrate it.

3. **Aplectana brygooi** n. sp.

Description (fig. 3)

Lateral alae narrow, extending from anterior end to tail in both sexes. Numerous small somatic papillae present. Oral opening triangular, lips small. Cephalic extremity with six minute labial papillae and six outer papillae of which the submedian pair is markedly small. Anterior extremity of oesophagus with three tooth-like projections covered with thick cuticle.

Male (holotype) : Total length 3.0 mm. Length of oesophagus 380 µm (pharyngeal portion of corpus 44 µm, posterior portion of corpus 229 µm, isthmus 40 µm, and bulb 67 µm). Nerve ring 190 µm and excretory pore 269 µm from anterior extremity. Tail

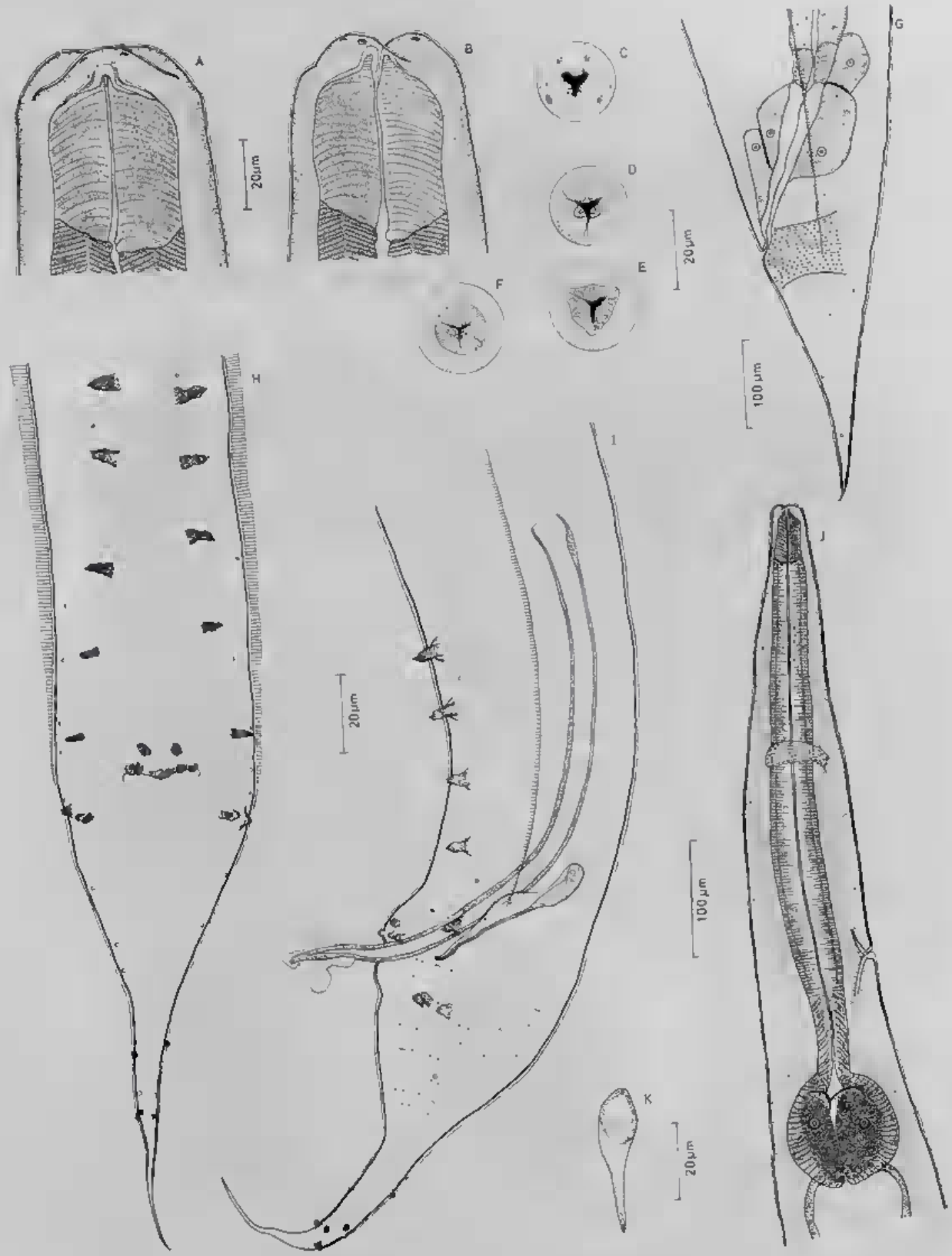

FIG. 3. — *Aplectana brygooi* n. sp. : A, B, C, anterior extremity, dorsal, lateral and apical view ; D, *idem* optical section through lips ; E, *idem*, optical section at base of buccal cavity ; F, *idem*, optical section through anterior end of œsophagus ; G, tail of female, lateral view ; H, I, caudal end of male, ventral and lateral view ; J, anterior end, lateral view ; K, gubernaculum, dorsal view.

141 µm long, thick in anterior half and tapering rapidly to sharp point in posterior half. Anterior half of tail with prominent muscle bands directed dorso-ventrally. Caudal papillae numerous, distinguished from somatic papillae by their larger size. Posterior half of tail with 3-4 pairs of small caudal papillae irregularly distributed, although the most posterior two pairs usually occur together in a prominent group. Anterior half of tail with one pair of large lateral papillae located close to two pairs of adjacent large sublateral papillae. Anus wide, anterior lip with three pairs and one large unpaired papillae. Preanal region with five pairs of conspicuously large subventral papillae which are up to 10 µm in length. Spicules prominent, 249 µm long, with a characteristic wing-like membranous structure on the distal extremity (see fig. 31). Gubernaculum 51 µm long, with markedly thick proximal end.

Female (allotype) : Total length 3.7 mm. Length of oesophagus 600 µm (pharyngeal portion of corpus 47 µm, posterior portion of corpus 400 µm, isthmus 67 µm, bulb 86 µm). Nerve ring 245 µm, excretory pore 429 µm, and vulva 2.4 mm from anterior extremity. Both ovaries located anterior to vulva. Eggs in uteri numerous ; approximately 25 in posterior uterus and 30 in anterior uterus. Eggs oval, thin-shelled, 78-106 µm long and 44-49 µm wide (based on 5 specimens). Tail 163 µm long, conical and sharply pointed.

Paratypes : Dimensions of one female and two male paratypes are as follows. *Males* : 1.4-1.6 mm long ; oesophagus 349-360 µm long (pharyngeal portion of corpus 32-37 µm, posterior portion of corpus 236-241 µm, isthmus 32 µm, bulb 49-50 µm) : nerve ring 95-161 µm and excretory pore 227-246 µm from anterior extremity ; spicules 178-184 µm, gubernaculum 35-41 µm, and tail 86-97 µm long. *Female* : 2.6 mm long ; oesophagus 527 µm long (pharyngeal portion of corpus 41 µm, posterior portion of corpus 374 µm, isthmus 35 µm and bulb 77 µm) ; nerve ring 234 µm, excretory pore 367 µm, and vulva 1.7 mm from anterior extremity ; tail 137 µm long.

Other specimens : Dimensions of three male and two female specimens from *Mantidactylus* sp. are as follows. *Males* : 1.9-2.0 mm long ; oesophagus 432-461 µm long (pharyngeal portion of corpus 40-47 µm, posterior portion of corpus 270-318 µm, isthmus 30-51 µm, bulb 66-70 µm) ; nerve ring 177-190 µm, excretory pore 298-314 µm from anterior extremity ; spicules 147-163 µm, gubernaculum 41-48 µm, and tail 108-111 µm long. *Females* : 2.5-3.8 mm long ; oesophagus 580-635 µm long (pharyngeal portion of corpus 44-49 µm, posterior portion of corpus 377-437 µm, isthmus 44-64 µm, bulb 95-105 µm) ; nerve ring 205-260 µm, excretory pore 380-468 µm, vulva 1.7-2.6 mm from anterior extremity ; tail 132-140 µm long.

Specimens examined : (1) MNHN 77G (type specimens from *M. betsileo*). (2) MNHN 69G (*M. lugubris*). (3) MNHN 64G (*Mantidactylus* sp.). (4) MNHN 39H (*B. luteus*).

Locality : The type locality is Tamatave, Madagascar. All specimens of this species were from Madagascar.

Hosts : *Mantella betsileo* (Grandidier, 1872) (Ranidae), *Mantidactylus lugubris* (A. Duméril, 1853) (Ranidae), *Mantidactylus* sp., *Boophis luteus* Boulenger, 1882) (Ranidae).

Discussion

A. brygooi n. sp. is closely related to *A. hylambatis*, *A. chamaeleonis*, and *A. courdurieri* from Africa and Madagascar. In these species the anterior half of the male tail is thick and has conspicuous dorso-ventrally directed muscles not observed in other *Aplectana* spp. There are also similarities in the distribution of caudal papillae in males. However, *A. brygooi* can be distinguished easily from these other three species in the possession of markedly long preanal papillae and in the distinctive shape of the distal extremity of the spicules.

A. brygooi also resembles *Raillietnema zonosauri* Caballero, 1968, in male caudal features. These species may be distinguished in that *R. zonosauri* has sharply pointed spicules lacking alate structures and the preanal papillae are not unusually large. The allotype of *A. brygooi* is a relatively large worm which has numerous eggs in the uteri and thus this species has been referred to *Aplectana* rather than *Raillietnema* (see Chabaud, 1978). However several small females which were examined contained a small number of eggs arranged in a similar fashion to that observed in *Raillietnema*. Apparently in *A. brygooi* there is a great variability in size of sexually mature adult worms. *A. brygooi* appears to be related to *Raillietnema* spp.

4. **Aplectana chamaeleonis** (Baylis, 1929) Travassos, 1931

Oxysomatium chamaeleonis Baylis, 1929.
Aplectana dogieli (Skrjabin, 1916) sensu Schmidt & Canaris, 1968.

Redescription (fig. 4)

Lateral alae narrow, extending from anterior end to tail in both sexes. Numerous small somatic papillae present. Anterior end and cephalic extremity as in *A. hylambatis*.

Male (USNM 63123, 3 specimens) : Total length 3.0-3.6 mm. Oesophagus 620-655 µm long. Nerve ring 250-285 µm and excretory pore 430-485 µm from anterior extremity. Tail 142-167 µm long, slender, sharply pointed. Depression of variable size present or absent on ventral surface of anal region. Anterior half of tail relatively wide and with prominent lateral musculature. Posterior border of anus with comblike cuticular fringe approximately 25 µm wide. Caudal papillae distributed as follows : 5-9 large preanal subventral pairs ; one large sublateral pair adanal ; one large unpaired and 3 pairs on anterior lip of anus ; 2 large subventral pairs located close together just posterior to anus ; 2 small subdorsal pairs and 2 subventral pairs on posterior half of tail. Spicules prominent, 195-214 µm long, curved ventrally in mid-portion, with blunt capitulum and sharply pointed distal extremity. Distal end of spicules with a prominent sheath approximately 10-20 µm long. Gubernaculum prominent, 57-67 µm long.

Female (3 specimens) : Total length 3.7-4.2 mm. Oesophagus 660-737 µm long. Nerve ring 260-310 µm, excretory pore 465-530 µm and vulva 2.5-2.8 mm from anterior extremity. Both ovaries located anterior to vulva. Tail 150-207 µm long, conical and sharply pointed. Eggs oval, 55-75 µm long and 40-50 µm wide.

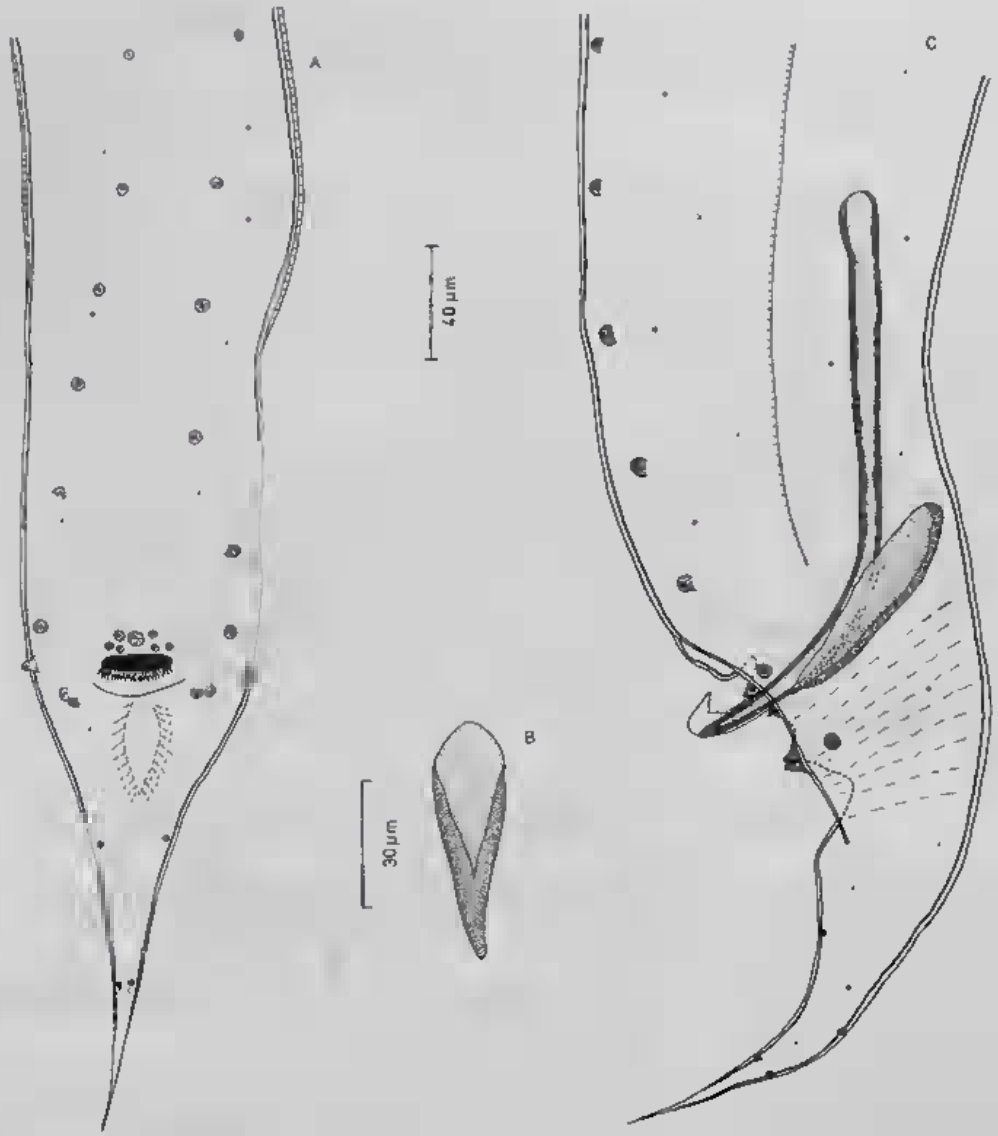

Fig. 4. — *Iplectana chamaeleonis* (Baylis, 1929) Travassos, 1931 : A, caudal end of male, ventral view B, gubernaculum, dorsal view ; C, caudal end of male, lateral view.

Specimens examined : (1) BM 1929.10.23.91-96 (type specimens from *C. fischeri*, Tanzania). (2) USNM 63123 (*Bufo* sp., Kenya, catalogued under *A. dogieli*). (3) BM 1966.13-20 (*B. angolensis*, Ethiopia). (4) BM 1966.21-25 (*T. nilotica*, Ethiopia). (5) MNHN 1066BA (*Bufo* sp., Saudia Arabia). (6) MNHN 1072B (*B. viridis*, Tunesia). (7) MNHN 1075BA (*Bufo* sp., Algeria). (8) MNHN 283NJ (*B. calamita*, bord du Rhône, France). (9) MNHN 1105BA (*Hylarana* sp., Ivory Coast).

Locality : The type locality is Tanzania. This species has also been reported in Ethiopia (Chen, 1966), Kenya (Schmidt & Canaris, 1968), Madagascar (Brygoo, 1963), West Africa (Sandground, 1933), Banco, Ivory Coast (present study), Ahha, Saudia Arabia (present study), Tunesia (present study), Bou Saada, Algeria (present study), bord du Rhône, France (present study).

Hosts : *Chamaeleo fischeri*, *Bana angolensis* Bocage, *Hylarana* sp. *Bufo viridis* (new host record), *B. calamita* (new host record), *Bufo* sp. (three separate reports from Africa and Saudia Arabia), *Astylosternus robustus*, *Tilapia nilotica* (freshwater fish).

Discussion

The original description of *A. chamaeleonis* is not detailed. Chen (1966) reexamined the type specimens and published a redescription which is augmented with further details herein. *A. chamaeleonis* closely resembles *A. hylambatis*, and in cephalic morphology and shape of the spicules and guhernaculum these species are indistinguishable. Males can be reliably distinguished only by the location in *A. hylambatis* of two pairs of adjacent postanal papillae in the mid-region of the tail which in *A. chamaeleonis* are found close to the anus.

The type specimens of *A. chamaeleonis* were from a chamaeleon, although this species also occurs commonly in anuran amphibians and it has been reported once in the cichlid fish *Tilapia nilotica* (Chen, 1966). This is the only report of an *Aplectana* in fish. Chen suggested that the source of infection may have been predation on infected amphibians. However, *T. nilotica* is mainly herbivorous (Sandon & Amin al Tayib, 1953) and it is possible that infection resulted from ingestion of contaminated littoral vegetation. It is of interest to note that one cosmocercoid, *Raillietnema synodontisi* Vassiliadès, 1973, apparently occurs exclusively in fresh-water fish of Africa.

5. **Aplectana courdurieri** Chahaud & Brygoo, 1958

Specimens examined : (1) MNHN 58G, 62G, 81G, 100G (*R. mascareniensis*). (2) MNHN 89G (*R. labrosa*). (3) MNHN 71G (*M. guttulotus*). (4) MNHN 93G (*M. ulcerosus*). (5) MNHN 91G (*M. auriautica*). (6 MNHN 75G (*B. goudoti*).

Locality : Madagascar. This species is apparently restricted to this island, although *R. mascareniensis* is widely distributed on the mainland of Africa.

Hosts : *Rana mascareniensis* Duméril & Bibron, *Bana labrosa* Cope (new host record), *Mantidactylus guttulatus* (Boulenger) and *M. ulcerosus* Boettger) (new host records), *Mantella auriautica* Macquard (new host record), *Boophis gaudoti* Tschudi) (new host record). Three reptiles (*Liopholidophis lateralis*, *Liocheterodon geayi*, *Madagascarophis colubrina*) and one bird (*Ardea ardea*) have been reported with *A. courdurieri* as an accidental parasitism (Ghadirian, 1968 ; Vassiliadès, 1970).

Discussion

The original description of this species is detailed and a redescription is not necessary. *A. courdurieri* (fig. 5) most closely resembles *A. chamaeleonis* in cephalic morphology and in the number and distribution of the caudal papillae in males. Also males of both species have conspicuous bands of dorso-ventrally directed muscles in the anterior half of the tail and the posterior lip of the cloaca has a minute comb-like fringe located on an elevation of the hypodermis. These species can be distinguished by the presence in male *A. courdurieri* of a bilobed mamelon-like protuberance on the posterior border of the anus which

is not present in *A. chamaeleonis*. In *A. courdurieri* the spicules are markedly slender and much longer (365 µm) than the gubernaculum (50 µm) whereas in *A. chamaeleonis* the spicules are robust and shorter (190-220 µm) relative to the guhernaculum length (50-85 µm). Females differ in that the tail in *A. courdurieri* is twice the length as in *A. chamaeleonis*.

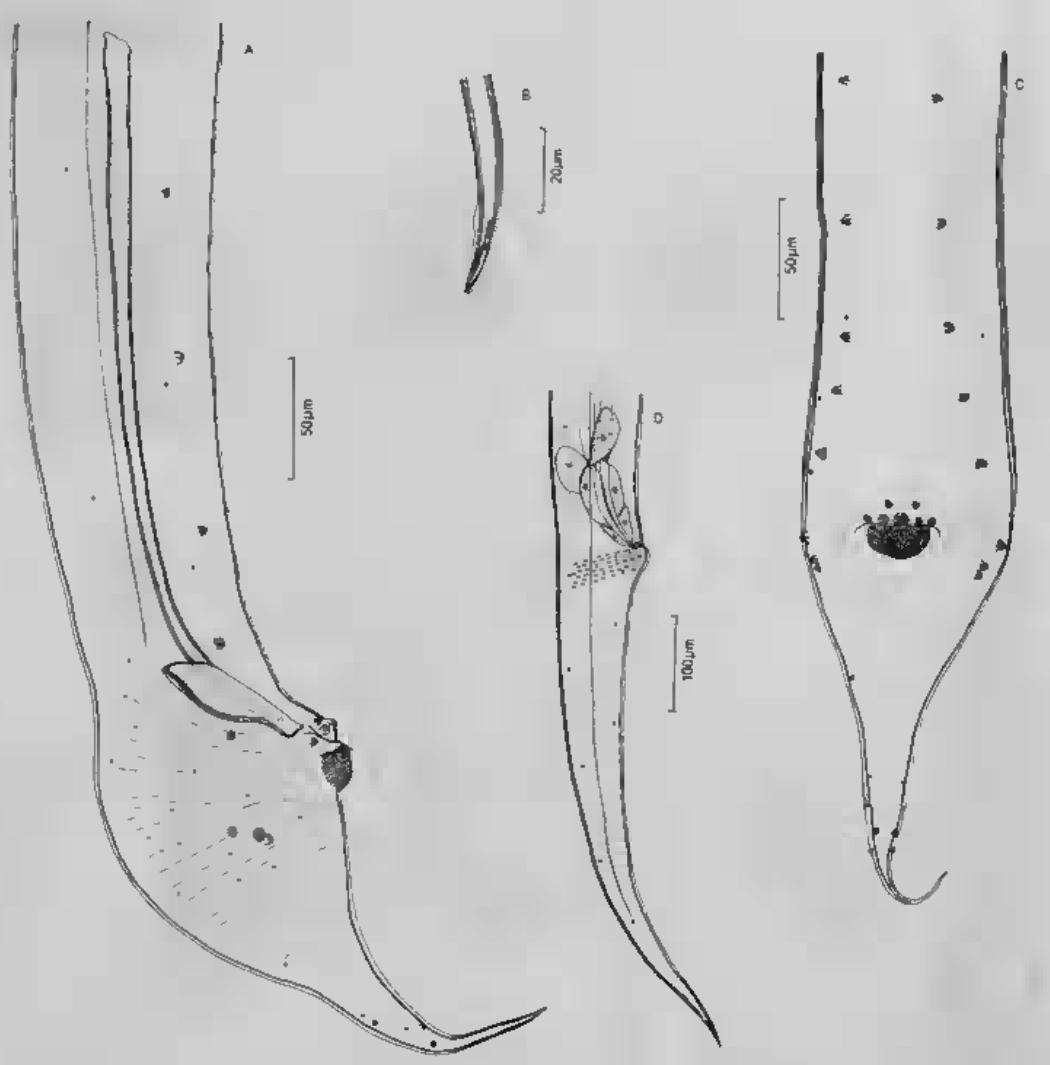

Fig. 5. — *Aplectana courdurieri* Chabaud & Brygoo, 1958 : A, caudal end of male, lateral view ; B, distal end of spicule, lateral view ; C, caudal end of male, ventral view ; D, tail of female, lateral view.

6. **Aplectana hylambatis** (Baylis, 1927) Travassos, 1931

Oxysomatium hylambatis Baylis, 1927.

Redescription (fig. 6)

Lateral alae narrow, extending from anterior end to tail in both sexes. Somatic papillae small and numerous. Oral opening triangular, lips large. Cephalic extremity

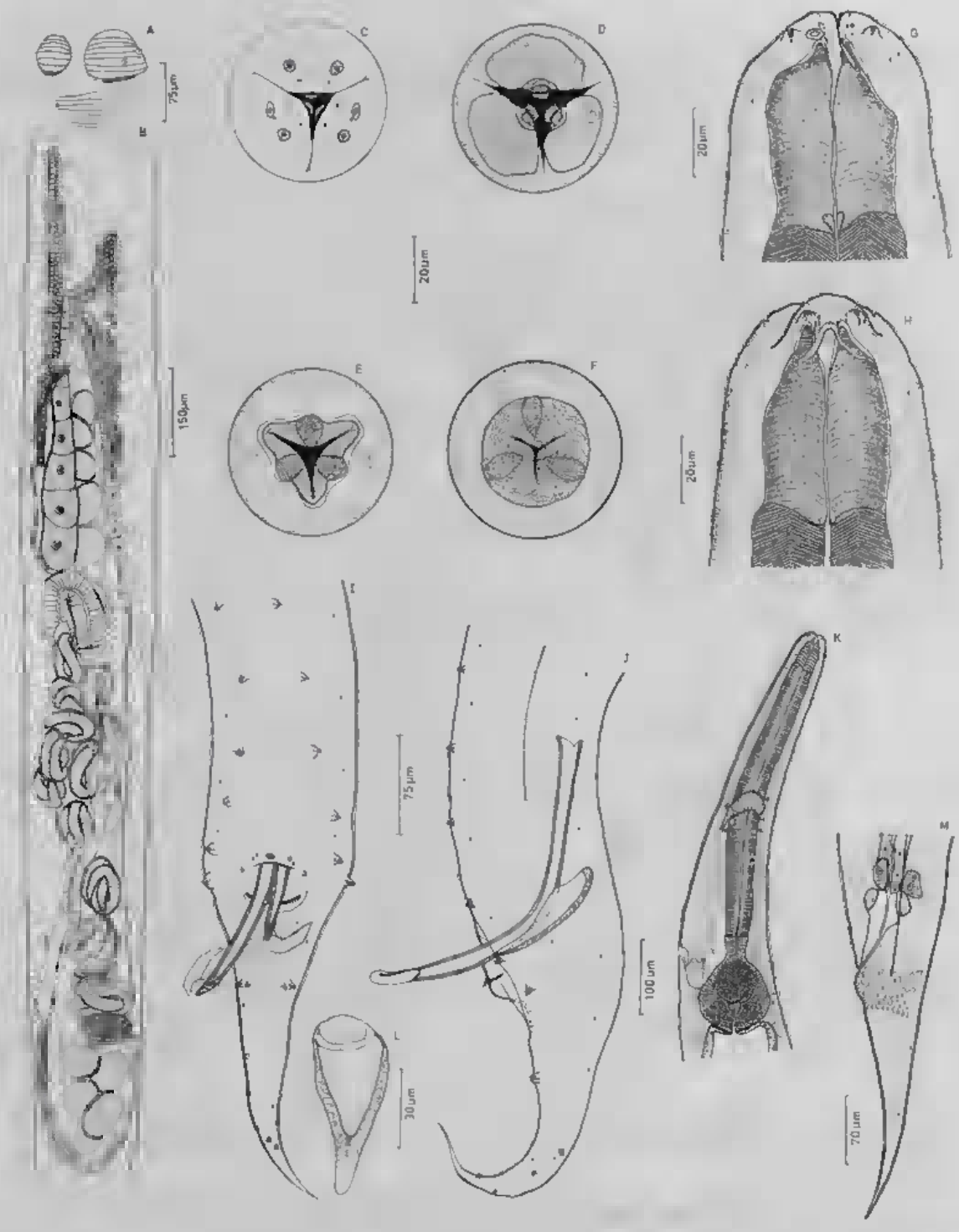

FIG. 6. — *Aplectana hylambatis* (Baylis, 1927) Travassos, 1931 : A, cuticular structures around vulva, ventral view ; B, reproductive system of female, ventral view ; C, anterior extremity, apical view ; D, *idem*, optical section through lips ; E, *idem*, section through base of lips ; F, *idem*, section through anterior end of œsophagus ; G, H, anterior extremity, lateral and dorsal views ; I, J, caudal end of male, ventral and lateral view ; K, anterior end, lateral view ; L, gubernaculum, dorsal view ; M, tail of female, lateral view.

with a circle of six labial papillae and six outer papillae. Submedian pair of outer papillae minute in size. Amphids large. Anterior extremity of oesophagus with three tooth-like projections covered with thick cuticle. Inner edge of each projection with small cuticular spike projecting into buccal cavity.

Male (CIH 584/26, 10 specimens) : Total length 2.6-3.2 mm. Oesophagus 545-620 µm long. Nerve ring 245-265 µm, and excretory pore 436-502 from anterior extremity. Tail 225-272 µm long, slender, sharply pointed. Depression of variable size present or absent on ventral surface just posterior to anus. Anterior half of tail with prominent bands of muscular tissue between region of ventral depression and dorsolateral surface of tail. Posterior border of anus with comb-like cuticular fringe approximately 35 µm wide. Caudal papillae constant in number and distributed as follows : 5 large preanal subventral pairs ; one large sublateral pair adanal ; one large unpaired and three pairs on anterior lip of anus ; 2 large subventral pairs located close together in midregion of tail ; posterior half of tail with subdorsal pair, two lateral pairs and one subventral pair of small papillae. Spicules prominent, 260-293 µm long, bent slightly ventrally in mid-portion, with blunt capitulum and sharply pointed distal extremity. Distal end of spicules covered by a prominent hook-shaped membrane approximately 40-50 µm long and usually directed laterally. Distal third of spicules often extruded out of body. Gubernaculum prominent, 90-100 µm long.

Female (6 specimens) : Total length 3.2-3.8 mm. Oesophagus 602-730 µm long. Nerve ring 235-300 µm, excretory pore 450-540 µm and vulva 2.1-2.5 mm from anterior extremity. Vulva surrounded by 2-3 mamelon-like cuticular protuberances. Both ovaries located anterior to vulva. Tail 245-273 µm long, conical and sharply pointed. Eggs oval, 68-94 µm long and 46-58 µm wide.

Other specimens : Dimensions of 5 male and 5 female specimens from *Bufo* of South America are as follows. *Males* : 4.2-5.0 mm long ; oesophagus 637-672 µm long (pharyngeal portion of corpus 44-56 µm, posterior portion of corpus 431-459 µm, isthmus 34-47 µm, bulb 100-119 µm) ; nerve ring 259-278 µm, excretory pore 472-559 µm from anterior extremity ; spicules 319-350 µm, gubernaculum 109-116 µm, and tail 244-303 µm long. *Females* : 4.8-6.3 mm long ; oesophagus 741-812 µm long (pharyngeal portion of corpus 47-63 µm, posterior portion of corpus 519-575 µm, isthmus 34-41 µm, bulb 122-137 µm) ; nerve ring 281-311 µm, excretory pore 481-616 µm, vulva 3.2-4.2 mm from anterior extremity ; tail 209-272 µm long.

Specimens examined : (1) BM 1927.7.22.21-23 (type specimens from *L. aubryi*). (2) CIH 548/26 (*B. mauritanicus*, London Zoo (Africa)). (3) MNHN 622 CA (*B. achalensis*, Argentina).

Locality : The locality of the type is Macenta, Guinea, Africa. This species also occurs in Cordoba, Argentina, South America.

Hosts : *Leptopelis aubryi* (Duméril), *Bufo mauritanicus* Schlegel (new host record), *Bufo achalensis* Cei (new host record).

Discussion

The anal ventral region in the male syntypes of *A. hylambatis* is deformed into a prominent depression. In the original description this was interpreted as a normal morpholo-

gieal feature of the male caudal region. However, examination of a series of specimens from *Bufo mauritanicus* of Africa and *Bufo achalensis* of Argentina which includes both distorted and undistorted male tails reveals that it is a fixation artifact. Baylis (1927) referred to the caudal depression in male syntypes as being " bounded laterally by enticular ridges resembling alae ". The " ridges " represent the distorted cuticle and hypodermis of the sublateral portion of the anal region and reference to them as alae or as a diagnostic character for the species appears to be a misinterpretation. The inaccurate description of the number and location of the caudal papillae in the original description was due to distortion of the type specimens.

A. hylambatis closely resembles *A. chamaeleonis* (see comments on this species for morphological differences). It is also similar to *A. pudenda* Masi Pallares & Maciel, 1974, from Brazilian amphibians in the appearance of the distal end of the spicules, the numbers and distribution of the postanal papillae in males, and the shape of the tail. However, these species may be easily distinguished by the presence in *A. pudenda* of an extra pair of large sublateral preanal papillae beside the subventral paired rows of papillae.

The occurrence of *A. hylambatis* in *Bufo* of Africa and South America is the first confirmed report of an *Aplectana* sp. occurring on both sides of the Atlantic Ocean.

7. **Aplectana leesi** Hristovski & Riggio, 1975

Redescription (fig. 7)

Lateral alae narrow, extending from anterior end to about 100 µm anterior to anus in males and to distal extremity of tail in females. Somatic papillae large: Oral opening triangular, three small lips present. Each lip with thin cuticular flange extending over mouth opening. Cephalic extremity with six minute labial papillae and six outer papillae of which the submedian pair is much smaller than the other papillae. Amphids large. Anterior extremity of oesophagus with three tooth-like projections covered by thick ring of cuticle. Gravid females markedly larger than males.

Male (4 specimens) : Total length 4.4-5.4 mm. Oesophagus 553-619 µm long. Nerve ring 281-313 µm and excretory pore 456-481 µm from anterior extremity. Tail 184-216 µm long, slender and sharply pointed, conical in well fixed specimens, occasionally with slight depression on ventral postanal surface if poorly fixed. Caudal papillae numerous. Preanal region with two subventral rows of 7-10 pairs of large caudal papillae which become progressively smaller and less conspicuous anteriorly, finally becoming indistinguishable from somatic papillae. Anterior lip of anus with three pairs and one unpaired caudal papillae. Unpaired papilla markedly large, supported by leaf-like cuticular flange under body cuticle. One large pair of lateral caudal papillae present at level of anus. Anterior portion of tail with two large pairs of subventral caudal papillae located close together. Midregion of tail with one large pair of subdorsal papillae. Posterior extremity of tail with two pairs of papillae located close together. Phasmids conspicuous, located in posterior portion of tail. Spicules prominent, 216-247 µm long, with sharply pointed distal extremity lacking membranous structure. Spicule widest at proximal end, gradually tapering posteriorly. Gubernaculum 53-72 µm long, well chitinized, with bulbous proximal end.

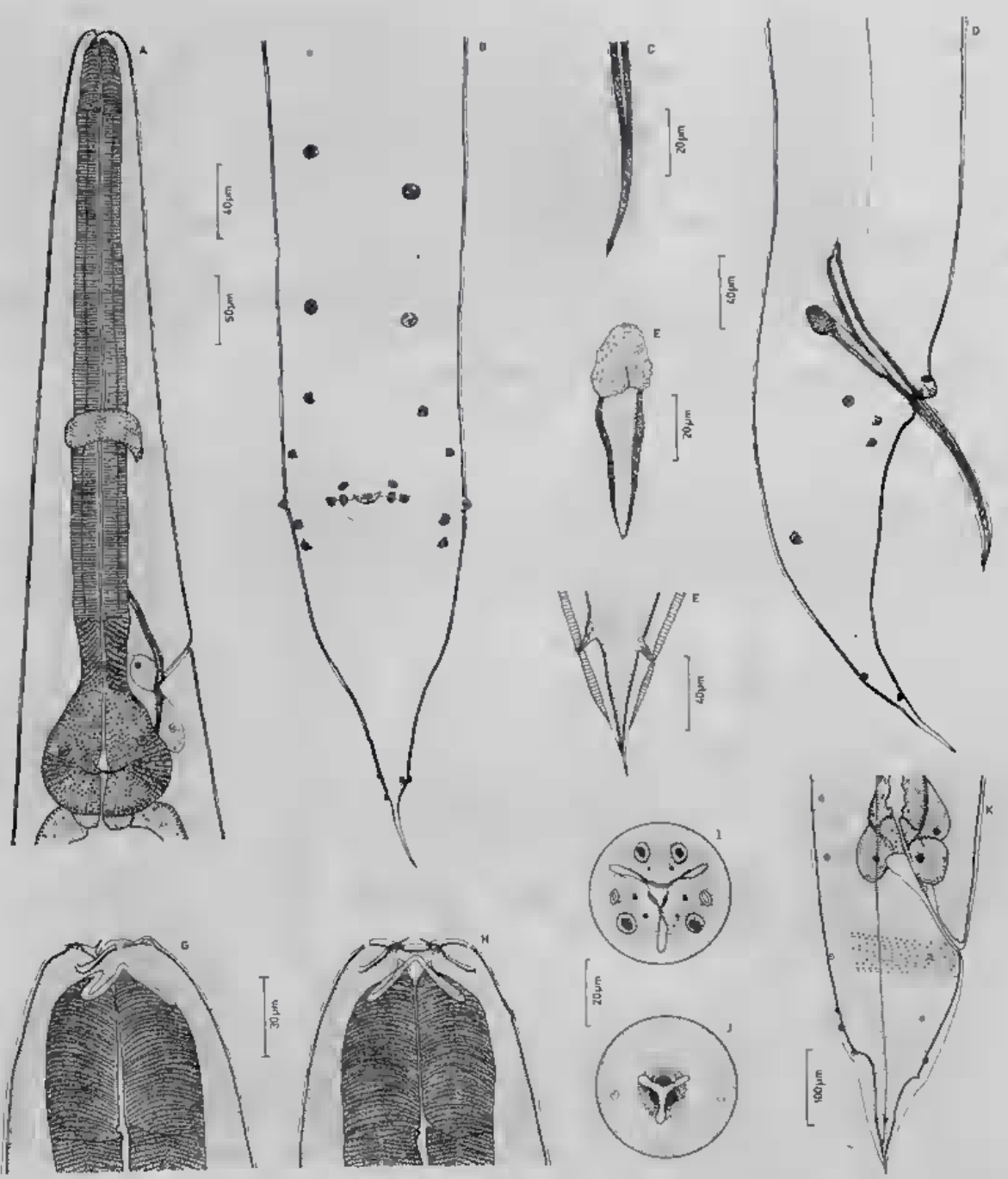

Fig. 7. — *Aplectana leesi* Hristovski & Riggio, 1975 : A, anterior end, lateral view ; B, caudal end of male, ventral view ; C, distal extremity of spicule, lateral view ; D, caudal end of male, lateral view ; E, gubernaculum, dorsal view ; F, distal extremity of female tail, ventral view ; G, H, I, cephalic extremity of female, lateral, dorsal and apical view ; J, *idem*, optical section through buccal cavity ; K, tail of female, lateral view.

Female (5 specimens) : Total length 6.7-12.2 mm. Oesophagus 713-781 µm long. Nerve ring 344-450 µm, excretory pore 569-719 µm and vulva 4.2-7.6 mm from anterior extremity. Both ovaries located anterior to vulva. Anterior lip of vulva forming rounded swelling. Somatic papillae numerous and relatively large near vulvar opening. Tail 284-353 µm long, thick in proximal half and sharply pointed in distal half. Posterior half of tail with markedly thick body cuticle. Phasmids conspicuous, located in posterior quarter of tail. Eggs oval, 91-116 µm long, 63-66 µm wide (based on 5 specimens).

Specimens examined : MNHN 1106BA (from *D. sardus*). Type specimens have not been made available for study.

Locality : Sartene, Corsica. The locality of the type was given as Sicily, although Hristovski & Riggio (1975) also found the species in Corsica and Malta.

Hosts : *Discoglossus pictus* Camerano, *Discoglossus sardus* Tschudi.

Discussion

The original description of this species is inadequate. *A. leesi* most closely resembles *A. brumpti* and *A. linstowi*. However, it is easily differentiated from both these species by the distribution of caudal papillae on the male tail, and the shape of the spicules, gubernaculum and female tail.

8. **Aplectana linstowi** Yorke & Maplestone, 1926

Nematoxys unguiculatus Linstow, 1906.
Oxysoma unguiculatum (Linstow, 1906) Skrjabin, 1916.
Oxysomatium unguiculatum (Linstow, 1906) Skrjabin, 1916.
Oxysomatium linstowi (Yorke & Maplestone, 1926) Skrjabin, Schikhobalova & Mozgovoi, 1951.
Neyraplectana linstowi (Yorke & Maplestone, 1926) Ballesteros-Marquez, 1945.
? *Aplectana kutassi* Ivanitzky, 1940.
? *Oxysomatium kutassi* (Ivanitzky, 1940) Skrjabin, Schikhobalova & Mozgovoi, 1951.
Aplectana brumpti sensu Frandsen, 1974.

Redescription (fig. 8)

Lateral alae prominent, extending from anterior end to tail. Numerous small somatic papillae present. Oral opening triangular, lips small. Cephalic extremity with a circle of six small labial papillae and six outer papillae. Submedian pair of outer papillae minute in size. Amphids large. Anterior extremity of oesophagus with three blunt projections covered with thick cuticle.

Male (4 specimens) : Total length 2.5-2.9 mm. Oesophagus 476-524 µm long. Nerve ring 220-250 µm and excretory pore 362-389 µm from anterior extremity. Tail 142-172 µm long, conical, tapering rapidly to sharp terminal point. Caudal papillae numerous. Preanal region with two subventral rows of approximately 7-9 pairs of large caudal papillae which become smaller and less conspicuous anteriorly, finally becoming

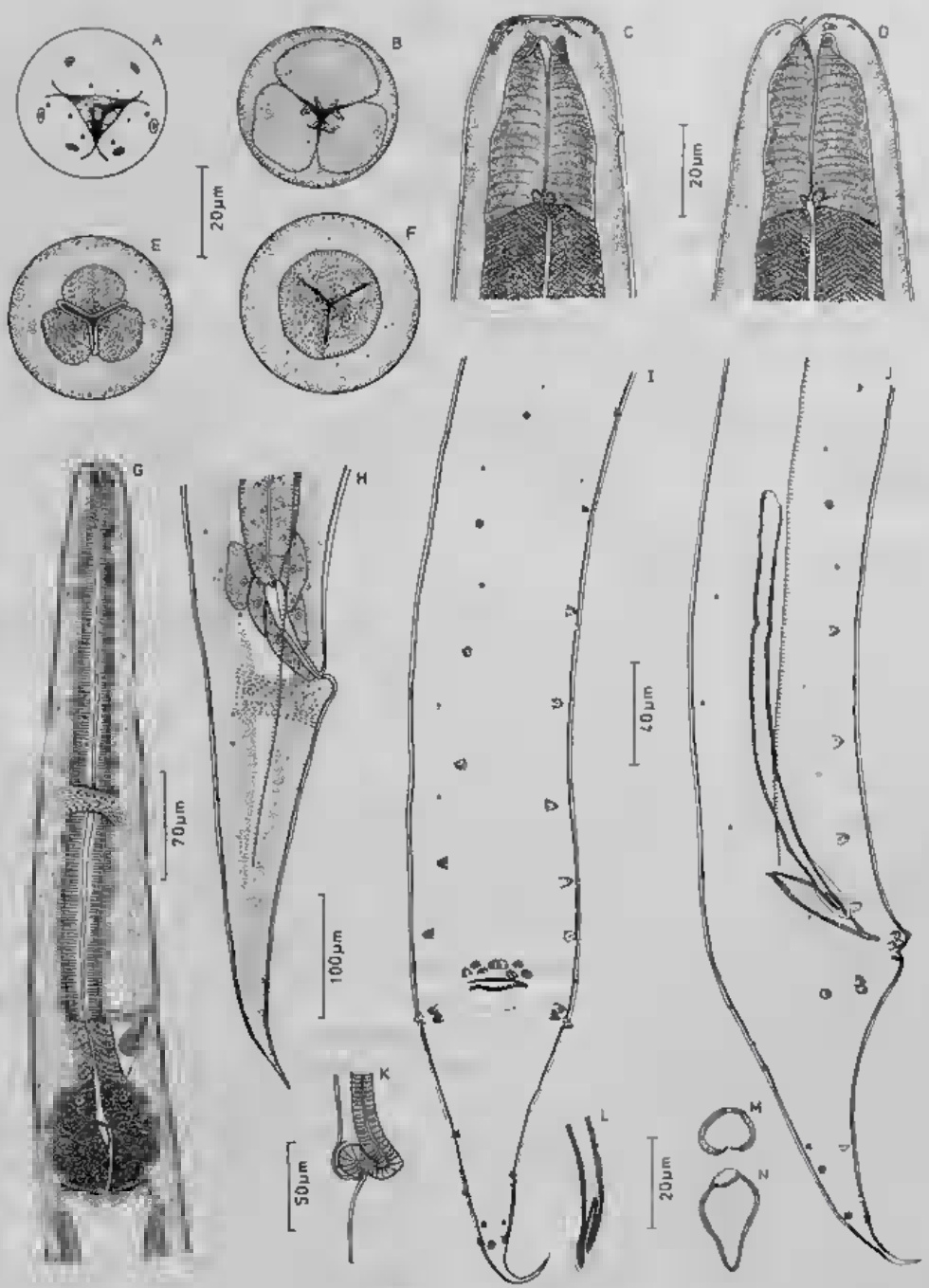

Fig. 8. — *Aplectana linstowi* Yorke & Maplestone, 1926 : A, anterior extremity, apical view ; B, *idem*, optical section through lips ; C, D, *idem*, dorsal and lateral view ; E, F, *idem*, optical section at base of lips and through anterior end of œsophagus ; G, anterior end, lateral view ; H, tail of female, lateral view ; I, J, caudal end of male, ventral and lateral view ; K, vulva, lateral view ; L, distal extremity of spicule, lateral view ; M, N, gubernaculum, cross-section through mid-region and dorsal view.

indistinguishable from somatic papillae. Anterior lip of anus with three pairs and one unpaired caudal papillae. First quarter of tail with 3 pairs of large papillae ; 2 subventral pairs located close together and one lateral pair at the same distance from the anus. Posterior half of tail with 6 pairs of papillae, one pair subdorsal, two pairs lateral, and three pairs subventral in position. Posterior border of anus with comb-like cuticular fringe approximately 25 µm wide. Spicules weakly chitinized, 175-204 µm long, with blunt capitulum. Posterior extremity of spicules with deep depression formed by infolding of terminal portion, covered by thin inconspicuous membrane. Gubernaculum prominent, 53-55 µm long, maximum width approximately 12 µm. Medial portion of gubernaculum thickly cuticularized, oval in cross-section, and located between distal end of spicules.

Female (6 specimens) : Total length 3.6-4.5 mm. Oesophagus 527-541 µm long. Nerve ring 247-265 µm, excretory pore 408-413 µm, and vulva 2.2-2.8 mm from anterior extremity. Both ovaries located anterior to vulva. Vulva opening into shallow depression formed by bulge in body wall at anterior vulvar lip. Tail 250-260 µm long, conical and sharply pointed. Eggs oval, 84-92 µm long and 48-54 µm wide. Many eggs containing a fully developed larva.

Specimens examined : Frandsen personal collection Bvi 8 (*B. viridis*, Denmark). Type specimens are not available for study.

Locality : : The locality of the type is Corfu, Greece. Other reliable reports include Denmark (present study), Czechoslovakia (Kozak, 1969), Ukraine (Ivanitzky, 1940).

Hosts : *Bufo viridis*, *B. bufo*, *Rana temporaria*, *Hyla arborea*.

Discussion

Yorke & Maplestone (1926) transferred *Nematoxys unguiculatus* Linstow, 1906, to *Aplectana* but under the new name *A. linstowi* to avoid creating a homonym with *Aplectana unguiculata* (Rudolphi, 1819) Miranda, 1924. The original description is inadequate by present standards. However, the lack of numerous postanal caudal papillae, the presence of large preanal papillae near the anus, and the illustration of the distal extremity of the spicules as blunt rather than sharply pointed and lacking a distinct sheath, would suggest that Linstow's specimens were not *A. acuminata*, *A. brumpti*, or *A. macintoshii*, the other *Aplectana* spp. from Europe. Worms examined in the present study agree with these characters and they have been assigned to *A. linstowi*.

The original description of *A. kutassi* Ivanitzky, 1940, is inadequate. However, the distal extremity of each spicule was described as forming two distinct points and in other respects the description is similar to *A. linstowi*. *A. kutassi* is provisionally designated a synonym.

Ubelaker (1966) reported *A. linstowi* in amphibians of Brazil. No description of these worms was given and this identification must be doubted.

9. **Aplectana macintoshii** (Stewart, 1914) Travassos, 1931

Oxysoma macintoshii Stewart, 1914.
Oxysomatium macintoshii (Stewart, 1914) Karve, 1927.

Oxysomatium macintoshii kirtipuri Singh, 1969.
Oxysomoides macintoshii (Stewart, 1914) Walton, 1927.
Stewartia macintoshii (Stewart, 1914) Rao, 1977.
? *Aplectana agubernaculum* Gupta, 1960.
? *Aplectana asiatica* Gupta, 1960.
? *Oxysomatium anurae* Biswas & Chaturvedi, 1963.
? *Oxysomatium stomatici* Biswas & Chaturvedi, 1963.
Oxysomatium brevispiculum Yuen, 1965.
? *Neoxysomatium longicaudatum* Ali & Ilyas, 1969.
Oxysomatium punctatum Walton, 1933.
Neyraplectana punctata (Walton, 1933) Skrjabin, Schikhobalova & Lagodovskaya, 1961.
Nematoxys commutatus R. sensu Schneider, 1866 [1].
Ascaris commutata Diesing, 1851, sensu Claparède, 1859.
Neyraplectana schneideri (Travassos, 1931) Ballesteros-Marquez, 1945.
Oxysomatium schneideri (Travassos, 1931) Kozlowska, 1960.
? *Aplectana stromi* Travassos, 1931.
Aplectana varelai Rodrigues, Rogrigues & Cristofaro, 1972.
Raillietnema praeputiale (Skrjabin, 1916) Semenov, 1929.
Neoraillietnema praeputiale (Skrjabin, 1916) sensu Kozak, 1969.
Aplectana acuminata (Schrank, 1788) sensu Hartwich, 1975.
Oxysomatium minutum Rasheed, 1965.

Redescription (figs. 9-10, tables 1-2)

Lateral alae present, extending from anterior end to tail, maximum width at mid-body 12-35 µm. Numerous minute somatic papillae present. Three large lips present. Cephalic extremity with two large subdorsal and two large subventral cephalic papillae. Amphids small. Anterior extremity in some specimens retracted slightly into body behind pharyngeal portion of oesophagus. Four large muscle trunks extending from anterior end to hypodermis at level of oesophageal isthmus, more distinct in gravid females than in subadult females and males. Anterior extremity of oesophagus with three short projections covered with thick cuticle. Pharyngeal portion of oesophagus relatively short and wide, especially in gravid females.

Male : Tail slender, sharply pointed. Numerous caudal papillae present, variable in number and distribution and indistinguishable from somatic papillae. 20-30 papillae present on tail. Many postanal papillae are not paired. All specimens examined had one small unpaired papilla on the anterior lip of the anus. Body cuticle on first half of tail markedly thick. Spicules well chitinized, capitulum blunt, distal extremity sharply pointed. Gubernaculum short, weakly chitinized.

Female : Both ovaries located anterior to vulva. Tail variable in shape ; anterior half slender in subgravid worms and often markedly thick in gravid specimens, posterior half spike-like. Eggs oval, 71-102 µm long and 48-80 µm wide. Some eggs containing a fully developed larva.

1. The " R " probably refers to Rudolphi but this is not clear in Schneider's publication.

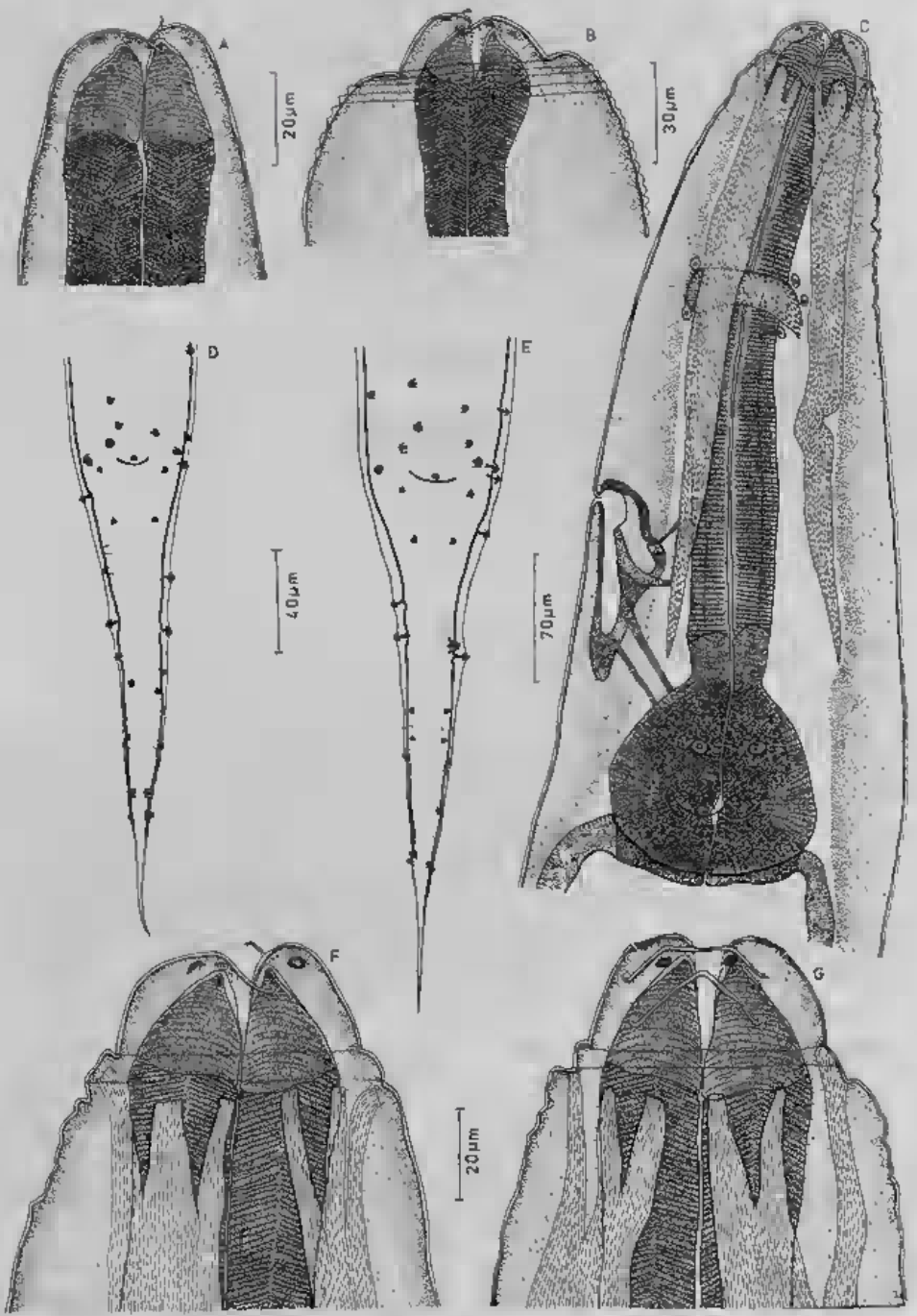

FIG. 9. — *Aplectana macintoshii* (Stewart, 1914) Travassos, 1931 : A, anterior extremity of subadult female, lateral view ; B, *idem*, large gravid adult female ; C, anterior end of adult female, lateral view ; D, E, caudal end of male, ventral view, showing variation in caudal papillae ; F, anterior extremity of adult female, lateral view ; G, *idem*, dorsal view. All drawings of specimens from *Bufo* of Africa.

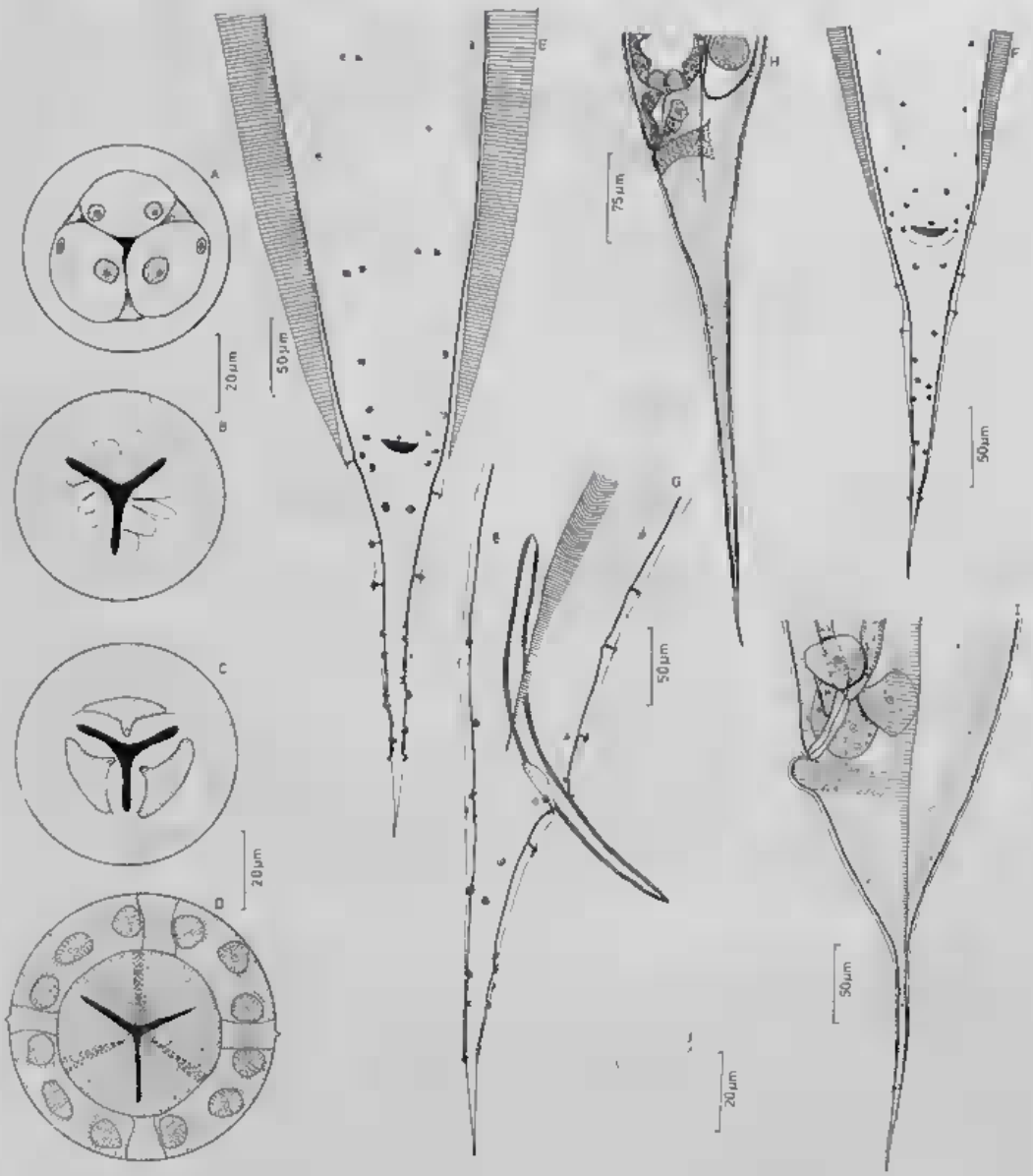

Fig. 10. — *Aplectana macintoshii* (Stewart, 1914) Travassos, 1931 : A, anterior extremity, apical view ; B, *idem*, optical section through lips ; C, *idem*, section through buccal cavity ; D, *idem*, section through anterior end of œsophagus ; E, F, caudal end of male, ventral view ; G, *idem*, lateral view ; H, I, tail of female, lateral view ; J. gubernaculum, dorsal view. Drawings A-D of specimens from *Bufo* of Africa ; E, G, I, J, from *Bufo* of Denmark ; F, J, from *Rana* of India.

TABLE 1. — Dimensions of *Aplectana macintoshii* (Stewart, 1914) from Africa, Europe and Asia. (All measurements in microns unless otherwise indicated.)

Locality	India	Africa	Denmark
Museum no.	BM 1928.2.17.116	MNHN 1097 BA	Bbu 29
No. examined	3 ♂, 2 ♀	4 ♂, 10 ♀	10 ♂, 10 ♀
Host	*R. tigrina*	*R. regularis*	*R. bufo*
Total length ♂	2.0-2.6 mm	1.2-1.8 mm	1.8-2.5 mm
♀	4.2-5.1 mm	2.4-5.0 mm	2.9-6.7 mm
Œsophagus length ♂	284-335	222-337	341-380
♀	423-532	389-494	584-708
Nerve ring * ♂	133-256	146-157	116-164
♀	208-214	145-185	218-288
Excretory pore * ♂	258-333	223-251	287-376
♀	399-460	256-356	389-575
Tail length ♂	210-228	180-205	203-242
♀	465-489	372-499	337-494
Spicule length	205-257	138-210	209-282
Gubernaculum length	23-26	25	24-30
Vulva *	2.4-2.5 mm	1.2-2.5 mm	1.7-4.1 mm

* Distance from anterior extremity.

SPECIMENS EXAMINED : (1) BM 1922.12.14.26 (type specimens from *B. stomaticus* and *R. tigrina*). (2) BM 1928.2.17.116 (*R. tigrina*, India). (3) BM 1974.2217 (*R. plancyi*, Taiwan). (4) BM 1964.1440.-1449 (*B. melanostictus*, Nagpur, India). (5) BM 1964.661-665 (*B. melanostictus*, Lucknow, India). (6) BM 1963.862-864 (type specimens of *Oxysomatium brevispiculum* from *R. erythraea*, Singapore). (7) USNM 25874 (type specimens of *Oxysomatium punctatum* from *R. limnocharis*, Philippines). (8) MNHN 43JE (*K. pulchra*, Malaya). (9) MNHN 25KL (*R. glandulosa*, Malaya). (10) MNHN 1097BA (*B.* "*regularis*", Sudan). (11) MNHN 1098BA (*V. niloticus*, Sudan). (12) BM 1929.10.23.97 (*N. vivipara*, Africa). (13) BM 1930.7.15.110 (*B. mauritanicus*, Africa). (14) MN11N 481D (*B.* "*regularis*", Congo). (15) MNHN 975H (*Rana* sp., Senegal). (16) MNHN 738Q (*B.* "*regularis*", Upper Volta). (17) MNHN 1074BA (*R. ridibunda*, Morocco). (18) FRANDSEN personal collection Bbu 29 (*B. bufo*, Denmark). (19) USNM 61906 (*B.* "*regularis*", Turkey). (20) BM 1923.12.19.27 (*R. temporaria*, England). (21) BM 1953.12.29.321 (*R. temporaria*, France). (22) MNHN 271D (*B. bufo*, France). (23) ZMB 1028 (5 ♂ specimens collected by SCHNEIDER (1866) from *R. temporaria* of Germany and designated syntypes of *A. schneideri* by HARTWICH (1975)). (24) 10C 30.696 & 30.697D (type specimens of *Aplectana varelai* from *R.* "*esculenta*", Portugal). (25) MNHN 1091BA (*Ptychadaena* sp., Congo). (26) USNM 67039 (*B. biporcatus*, Philippines). (27) MNHN 1099BA (*B.* "*regularis*", echantillon, Zaire). (28) MNHN 50DS (*B.* "*regularis*", Gabon).

TABLE 2. — Total length of males, spicule and gubernaculum length of *Aplectana macintoshii* (Stewart, 1914) from various localities.

AUTHORITY	SPECIES EPITHET	LOCALITY	TOTAL LENGTH (in mm)	SPICULE LENGTH (in µm)	GUBERNACULUM LENGTH (in µm)
Stewart, 1914	macintoshii	India	1.0-1.5	178-230	—
KARVE, 1927	macintoshii	Burma	2.0-2.5	240	22-32
ILSÜ & HOEPPLI, 1933	macintoshii	China	2.0-2.2	226	65
YUEN, 1965	macintoshii	Malaya	1.3-2.2	180-260	46-53
SINGH, 1969	macintoshii	India	1.5-1.8	200-250	—
SOOTA & CHATURVEDI, 1971	macintoshii	India	2.2	240-250	55-66
KOO, 1939	macintoshii	China	1.6	170	—
BISWAS & CHAKRAVARTY, 1963	anurae	India	2.4	210	—
BISWAS & CHAKRAVARTY, 1963	stomatici	India	1.4	160	—
GUPTA, 1960	agubernaculum	Bangladesh	1.9	250-270	—
GUPTA, 1960	asiatica	Bangladesh	1.9-2.7	260-320	70-90
YUEN, 1965	brevispiculum	Malaya	1.8-2.1	130-150	33
ALI & ILYAS, 1969	longicaudatum	India	1.3-2.0	140-270	28-34
TRAVASSOS, 1931*b*	schneideri	Germany	2.8-3.1	240-280	—
SEMENOV, 1929	praeputialis	USSR	1.5-2.2	220-270	—
KOZAK, 1969	stromi	Czechoslovakia	2.7-3.7	390-410	—
RODRIGUES *et al.*, 1972	varelai	Portugal	1.4-1.5	130-140	37-44
RASHED, 1965	minuta	Cameroon	0.76	170	—

Fig. 11. — *Aplectana macintoshii* (Stewart, 1914) Travassos, 1931 : locality records.

Locality : See fig. 11. In Asia this species is known from hosts in northern India, Bangladesh, Burma, Malaya, southeast China, Taiwan, and the Philippines. In Europe it has probably been confused with *A. acuminata* and other cosmocercoids ; records considered reliable from published descriptions include Germany (Travassos, 1931*b*), western Russia (Semenov, 1929), Czechoslovakia (Kozak, 1969), Turkey (Schad *et al.*, 1960), Portugal (Rodrigues *et al.*, 1972). The species is also reported herein for the first time in France and England. In Africa *A. macintoshii* has been reported in Cameroon (Rasheed, 1965), Sahara (Baylis, 1930), Tanzania (Baylis, 1929). It is reported herein time for the first in Sudan (Khartoum), Congo, Senegal, Upper Volta, Morocco.

Hosts : Asia — *Rana tigrina* Daud., *R. limnocharis vittigera* Wiegmann, *R. erythraea* (Schlegel), *R. glandulosa* Boulenger (new host record), *R. plancyi* Lataste (new host record), *Bufo stomaticus* Lütken, *B. melanostictus* Schneider, *B. biporcatus philippinicus* Gravenhorst (new horst record), *Hyla chinensis*, *Kaloula pulchra* Gray, *Varanus indicus*. Europe — *Rana temporaria* Linné, *R. ridibunda* Pallas, *B.* « *esculenta* », *R. arvalis*, *R. dalmatina*, *R. graeca*, *Bufo bufo* (Linné), *B. viridis*, *B.* " *regularis* " of Turkey, *Bombina bombina*, *Pelobates fuscus*, *Hyla arborea*, *Natrix natrix*. Africa — *Rana mascareniensis*, *Rufo* " *regularis* " from several localities, *R. mauritanicus*, *Nectophrynoides viviparus* (Tornier), *Varanus niloticus* (new host record), *Ptychadaena* sp. (new host record).

Discussion

Aplectana macintoshii is easily distinguished from all other *Aplectana* spp. in the Old World by the possession of a distinctive cephalic musculature especially in large worms,

the reduction in the number of cephalic papillae to four large ones, a markedly short and wide pharyngeal portion of the oesophagus (especially in large females), a slender male tail with numerous unpaired papillae, and the gubernaculum which is small and weakly chitinized. Males are relatively rare and they are usually markedly smaller in size than females.

Despite its distinctive morphology, there has been much taxonomic confusion concerning *A. macintoshii* and many new synonyms are proposed herein. This has resulted from the wide distribution of the species in three different zoogeographical zones, and from the markedly variable cephalic and male caudal morphology. In the present study a large number of species of *A. macintoshii* from Africa, Asia and Europe have been examined. The variations in morphology observed were independent of geographical origin and they were observed in series of specimens from the same individual host. Important variations were as follows.

1. *Cephalic end* : Fixation often results in the head being slightly retracted into the body (see fig. 8B). This occurs most frequently in large gravid females. The distinctive cephalic musculature is conspicuous in large female worms ; in males and small females it is relatively inconspicuous.

2. *Male caudal papillae* : Unlike many *Aplectana* spp. the caudal papillae on the tail are not all paired and they are markedly variable in position and number (see figs. 8D-E, 9E-F). For example, Yuen (1965) examined the distribution and number of papillae on 14 males from Malayan amphibians and he observed no two worms alike.

3. *Gubernaculum* : Since it is weakly chitinized and variable in size, the gubernaculum is easily overlooked in poorly cleared specimens. Thus a gubernaculum has been mentioned in some but not all descriptions herein referred to *A. macintoshii* (table 2).

4. *Spicules* : These vary markedly in length (table 2) and thus attempts to distinguish species on the basis of differences in spicule length (i.e. Yuen, 1965) have led to errors of interpretation.

5. *Female tail* : The shape varies with size of worms. In small females it is slender throughout its length whereas during development to the gravid stage it becomes thick in the proximal half (fig. 9I).

6. *Lateral alae* : These vary greatly in maximum width (5-35 µm).

Schneider (1866) published a description of a cosmocercoid from *Rana temporaria* of Germany under the name *Nematoxys commutatus* R. Travassos (1931*a*, *b*) described *Aplectana schneideri* for cosmocercoids from the same host and locality and he gave *Nematoxys commutatus* Schneider, 1866 (nec *Cosmocerca commutata* Diesing) as a synonym. Hartwich (1975) examined Schneider's specimens and designated them syntypes of *A. schneideri*. He further synonymized *A. schneideri* with *A. acuminata*. This cannot be accepted. *A. acuminata* sensu Travassos clearly differs from *A. schneideri* in the following : the male tail in *A. schneideri* is relatively more slender and provided with fewer papillae, the gubernaculum in *A. acuminata* is larger and more heavily chitinized, the tail in mature female *A. acuminata* is always conical in shape whereas in large *A. schneideri* it is thick in the proximal half and spike-like in the distal half, and the cephalic structures are different.

Aplectana schneideri Travassos, 1931, is herein designated a synonym of *A. macintoshii*. This is based on comparison of syntypes of *A. schneideri*, type specimens of *A. macintoshii*, as well as numerous other specimens from Europe and Asia.

Semenov (1929) described cosmocercoids from Russia under the name *Raillietnema praeputiale* (Skrjabin). The illustration of the male caudal end is most similar to *A. macintoshii*.

Type specimens of *Aplectana varelai* Rodrigues, Rodrigues & Cristófaro, 1972, from *Rana* " *esculenta* " of Portugal were examined. A character given as differentiating this species from all others except *A. stromi* Travassos, 1931, from *R.* " *esculenta* " of Russia was the presence of a number of somatic papillae surrounded each by a small plate-like structure. However, these structures appear to be superficial concretions in the body cuticle which vary much in appearance and may or may not be present in different specimens. They are possibly abnormalities or fixation artifacts of no value as a specific character. In morphology *A. varelai* is indistinguishable from *A. macintoshii* and it is herein designated a synonym. Similarly it is suggested *A. stromi* known only from female worms is synonymous with *A. macintoshii*. This species was illustrated with a female tail indistinguishable from large specimens of this species. A redescription of *A. stromi* by Kozak (1969) which included a description of male worms is clearly referrable to *A. macintoshii*.

The type specimens of *Oxysomatium minutum* Rasheed, 1965, from *Rana mascareniensis* of Cameroon have been lost. However, specimens examined in the present study from *Rufo* of West Africa are markedly similar in cephalic and male caudal morphology to Rasheed's description and they are considered conspecific with *O. minutum*. Since no morphological differences were observed between these African species and specimens of *A. macintoshii* from Asia, *O. minutum* is considered a synonym of *A. macintoshii*. Baylis (1929 ; 1930) reported *A. macintoshii* from anurans of Africa. His specimens have been examined and the identification is confirmed.

A. gubernaculum Gupta, 1960, *A. asiatica* Gupta, 1960, *Oxysomatium anurae* Biswas & Chakravarty, 1963, *Oxysomatium stomaticus* Biswas & Chakravarty, 1963, and *Neoxysomatium longicaudatum* Ali & Ilyas, 1969, from hosts in India and Bangladesh cannot be distinguished from *A. macintoshii*.

Type specimens of *Oxysomatium brevicaudatum* Yuen, 1965, were examined but unfortunately these include only females. Yuen distinguished between *A. macintoshii* and *O. brevispiculum* in two characteristics, namely the shape of the female tail and the presence of markedly short spicules (130-150 µm) in the 2 males he examined. However variability in shape of the female tail and spicule length (table 2) in *A. macintoshii* is greater than the differences considered by Yuen as separating *O. brevispiculum* from *A. macintoshii*. *O. brevispiculum* is herein designated a synonym of *A. macintoshii*.

The type specimens of *Oxysomatium punctatum* Walton, 1933 (4♀ worms, ♂ unknown) were examined. They conform in all morphological details to *A. macintoshii* and *O. punctatum* is designated a synonym of this species. The numerous small " bosses " on the body cuticle illustrated by Walton represent the somatic papillae.

10. **Aplectana praeputialis** (Skrjabin, 1916) Travassos, 1931

Oxyuris praeputialis Skrjabin, 1916.
Oxysomatium praeputiale (Skrjabin, 1916) Walton, 1933.
Neoraillietnema praeputialis (Skrjabin, 1916) Ballesteros-Márquez, 1945.
Aplectana praeputiale (Skrjabin, 1916) Le Van Hoa, 1962.
nec *Raillietnema praeputiale* (Skrjabin, 1916) sensu Semenov, 1929.
nec *Neoraillietnema praeputialis* (Skrjabin, 1916) sensu Kozak, 1969.

Specimens examined : MNHN 652CA (*Bufo* sp., Congo).

Locality : The locality of the type is "British East Africa" (? Kenya). Other reports include Nyakabera, Congo (Le Van Hoa, 1962), and West Africa (Taylor, 1924). Taylor's report from *Bufo* "*regularis*" may represent *A. macintoshii*.

Hosts : *Bufo* sp., ? *Bufo* "*regularis*".

Discussion

Aplectana praeputialis was originally described from female worms collected from *Bufo* sp. in East Africa. The type specimens are not available for study. Taylor (1924) reported the species in *Bufo regularis* of Nigeria and published a brief redescription of female worms. Le Van Hoa (1962) described male and female worms from *Bufo* sp. of the Congo under the name *Aplectana praeputiale* (Skrjabin, 1916). His female worms are still available for study but unfortunately they are in a poor state of preservation ; the single male worm he studied has been lost. The female worms are clearly of the *Aplectana* type. They do not differ morphologically from *Aplectana macintoshii* females described in the present study. However the male worms described by Le Van Hoa was characterized by a long and robust gubernaculum and the presence of 12 pairs of small papillae near the anus and on the tail and 5 pairs of large preanal subventral papillae. This is markedly different from *A. macintoshii* and other *Aplectana* spp. in Africa. Le Van Hoa also described the spicules as being markedly short (14 µm) and relatively wide. Both the proximal and distal ends were illustrated as being blunt and open-ended. This is most unusual for the Cosmocercinae and it is possible that the male worm was poorly fixed or that an error in observation was made.

Semenov (1929) described male and female cosmocercoids from anurans in Russia under the name *Raillietnema praeputiale* (Skrjabin). His description as well as that of *Neoraillietnema praeputialis* (Skrjabin) sensu Kozak, 1969, from Czechoslovakia is clearly referrable to *A. macintoshii* (see discussion under this species).

11. **Aplectana ranae** (Walton, 1931) n. comb.

Oxysomatium ranae Walton, 1931.

Specimens examined : USNM 50769 (1 female, type specimen).

Locality : Phillipines.

Host : *Rana magna*.

Discussion

A redescription of this species is not given here since there are no male specimens available for study. According to Walton the caudal end of males is characterized by 6 pairs of simple preanal, 2 pairs of adanal, and 2-3 pairs of postanal papillae. The tail is slender and sharply pointed in both sexes. This distinguishes this species from *A. macintoshii*, the only other species reported from Asia. However, the original description is not detailed and this species should be reexamined when more material becomes available.

The type female specimen has a cephalic extremity similar to that observed in gravid female *A. macintoshii*. The lips are relatively small and the three tooth-like projections of the anterior end of the oesophagus are short and blunt. In addition, narrow lateral alae and numerous small somatic papillae are present. The reproductive system is typical of the genus *Aplectana* and thus this species is reclassified herein as *Aplectana ranae* (Walton, 1931) n. comb.

12. **Aplectana vercammeni** Le Van Hoa, 1962

Locality : Congo, Africa.

Host : *Bufo* sp.

Discussion

The type specimens of this species have been lost. *A. vercammeni* most closely resembles *A. macintoshii* in the shape of the male and female tail, number and distribution of caudal papillae in males, and appearance of the spicules. A gubernaculum was not reported but Le Van Hoa had only one male worm and this structure may be weakly developed as in *A. macintoshii*. However, *A. vercammeni* can be distinguished from *A. macintoshii* in that it has a much longer oesophagus with a narrower bulb.

Species of doubtful status

13. **Oxysoma perezi** Gendre, 1911

Oxysomatium perezi (Gendre, 1911) Skrjabin, 1916.
Aplectana perezi (Gendre, 1911) Yorke & Maplestone, 1926.

O. perezi from *Chamaeleo gracilis* of French Guinea was inadequately described and the type specimens are unavaliable. The species has not been reported since the original description. It is clear from the description that *O. perezi* is a Cosmocercidae and that it belongs either to *Aplectana* or *Oxysomatium*. However, because the female reproductive tract was not described it is not known to which of these genera it should be assigned. The shape of the female tail, distribution of the few illustrated caudal papillae in males, and shape and size of the spicules (290 µm long) and gubernaculum (85 µm long) suggest that

it may be conspecific with *A. hylambatis* which occurs in the same locality in West Africa. However, the description is too incomplete to determine the status of this species and *O. perezi* is designated a *species inquirenda*.

Nearctic and neotropical species

New World species of *Aplectana* have not been examined in detail herein. An annotated list is provided of species which can definitely be placed in the genus from published descriptions.

14. **Aplectana bonariensis** (Gutierrez, 1945) Lent & Freitas, 1948

(Syn. : *Oxysomatium bonariensis* Gutierrez, 1945.) In *Bufo arenarum* of Brazil ; also in *B. arenarum* and *B. dorbignyi* of Uruguay (Lent & Freitas, 1948).

Lent & Freitas (1948) pointed out that the distal extremity of the spicules have a membrane-like expansion which is not fixed in shape as indicated by Gutierrez.

15. **Aplectana chilensis** Lent & Freitas, 1948

(Syn. : *Oxysomatium chilensis* (Lent & Freitas, 1948) Skrjabin, Schikhobalova & Mozgovoi, 1951 ; *Neyraplectana chilensis* (Lent & Freitas, 1948) Skrjabin, Schikhobalova & Lagodovskaya, 1961.) In *Rhinoderma darwini* of Chili.

16. **Aplectana crossodactyli** nom. nov.

(Syn. : *Neyraplectana travassosi* Vicente & Santos, 1970 ; nec *Aplectana travassosi* (Gomes & Motta, 1976.)) In *Crossodactylus gaudichaudi* of Brazil.

This species was not described in detail. It is similar to *A. delirae* and based on original descriptions these species cannot be readily distinguished.

17. **Aplectana orucifer** Travassos, 1925

(Syn. : *Neyraplectana crucifer* (Travassos, 1925) Ballesteros-Márquez, 1945 ; *Oxysomatium crucifer* (Travassos, 1925) Skrjabin, Schikhohalova & Mozgovoi, 1951.) In *Bufo crucifer* of Brazil.

Travassos (1931*b*) republished his original description and added two illustrations, a lateral view of the male caudal end and a lateral view of the female.

18. **Aplectana delirae** (de Fabio, 1971) n. comb.

(Syn. : *Neyraplectana delirae* de Fabio, 1971.) In *Bufo crucifer* of Brazil.

As noted above *A. delirae* may be conspecific with *A. crossodactyli*.

19. **Aplectana hamatospicula** Walton, 1940

(Syn. : *Aplecturis hamatospicula* (Walton, 1940) Skrjabin, Schikhobalova & Mozgovoi, 1951 ; *Oxysomatium hamatospiculum* (Walton, 1940) Skrjabin, Schikhobalova & Mozgovoi, 1951.) In *Bufo peltacephalus* of Cuba, *Hyla exemia* of Mexico and *Microhyla carolinensis* of Florida ; also in *Bufo taladei* of Cuba (Baruš, 1973).

Neither the original description nor redescriptions (see Walton, 1941 ; Baruš, 1973) of this species indicated the location of ovaries in female worms. Specimens studied by Walton (not designated as types) were examined (USNM 42053). The female reproductive tract is typical of *Aplectana*.

20. **Aplectana hoffmani** Bravo Hollis, 1943

(Syn. : *Oxysomatium hoffmani* (Bravo Hollis, 1943) Skrjabin, Schikhobalova & Mozgovoi, 1951.) In *Scaphiopus multiplicatus*, *Bufo marinus* of Mexico ; also in *B. marinus* of Costa Rica (Brenes & Bravo Hollis, 1959).

The reproductive system of females of this species was not described in detail, however, *A. hoffmani* is markedly similar to *A. itzocanensis* described in the same publication and from the same host.

21. **Aplectana itzocanensis** Bravo Hollis, 1943

(Syn. : *Oxysomatium itzocanensis* (Bravo Hollis, 1943) Skrjabin, Schikhobalova & Mozgovoi, 1951.) In *Scaphiopus multiplicatus* of Mexico ; also in *Bufo marinus* of Costa Rica (Brenes & Bravo Hollis, 1959) and *Bufo horribilis* of Mexico (Caballero Deloya, 1974).

The original description shows clearly that both ovaries are anterior to the vulva.

22. **Aplectana longicaudata** Walton, 1929

(Syn. : *Oxysomatium longicaudatum* (Walton, 1929) Walton, 1923.) In *Bana pipiens* of Illinois, United States ; also reported in *R. catesbeiana* (Brandt, 1936 ; Lank, 1971) and in *Plethodon glutinosus* and *Gyrinophilus porphyriticus* (Fischthal, 1955) of the U.S.

Syntypes of this species have been examined (USNM 50768) to confirm the classification to genus.

23. **Aplectana lopesi** Jorge da Silva, 1955

In *Hyla fuscovaria* of Brazil.

24. **Aplectana membranosa** (Schneider, 1866) Miranda, 1924

(Syn. : *Leptodera membranosa* Schneider, 1866 ; *Oxysomatium membranosum* (Schneider, 1866) Skrjabin, Schikhobalova & Mozgovoi, 1951.) In *Rana* sp. (?) of Brazil ; also reported in *Leptodactylus ocellatus* of Brazil (Miranda, 1924) and *L. ocellatus* and *Ceratophrys americana* of Uruguay (Lent & Freitas, 1948).

The original description is too inadequate to differentiate this species. Nevertheless, Miranda (1924) described an *Aplectana* sp. under this specific name and his revision is followed.

25. **Aplectana meridionalis** Lent & Freitas, 1948

(Syn. : *Oxysomatium meridionalis* Lent & Freitas, 1948) Skrjabin, Schikhobalova & Mozgovoi, 1951 ; *Neyraplectana meridionalis* (Lent & Freitas, 1948) Skrjabin, Schikhobalova & Lagodovskaya, 1961.) In *Ceratophrys americana* of Uruguay.

This species is reported for the first time in *Pleurodema borelli* (Leptodactylidae) of Jujuy, Argentina (MNHN 75HD).

26. **Aplectana mexicana** (Caballero, 1933) Ballesteros-Márquez, 1945

(Syn. : *Oxysomatium mexicanum* Caballero, 1933 ; *Neoxysomatium mexicanus* (Caballero, 1933 Yamaguti, 1961.) In *Dermatophis mexicanus* of Mexico ; also in *Dermophis costaricense* of Costa Rica, *Gymnophis mexicanus* of El Salvador, *Caecilia nigricans* of Ecuador, *Siphonops annulatus* of Paraguay (Ubelaker, 1966).

Spicule length was reported as 200 µm. However, from a drawing given with the description the spicule length is approximately 450 µm, and a photograph of a male caudal end shows that in some specimens spicule length is considerably longer than this.

27. **Aplectana micropenis** Travassos, 1925

(Syn. : *Oxysomatium micropenis* (Travassos, 1925) Skrjabin, Schikhobalova & Mozgovoi, 1951.) In *Elosia nasus* of Brasil.

The original description of this species was republished by Travassos (1931*b*) with the addition of an illustration of the female tail.

28. **Aplectana papillifera** (Araujo, 1977) n. comb.

(Syn. : *Neyraplectana papillifera* Araujo, 1977.) In *Dromicus typhlus* of Brazil.

This species was clearly illustrated with both ovaries anterior to the vulva.

29. **Aplectana pudenda** Pallarés & Maciel, 1974

In *Bufo paracnemis, Leptodactylus ocellatus, Hyla spegazzini, H. punctata* of Paraguay.

30. **Aplectana pusilla** Miranda, 1924

(Syn. : *Oxysomatium pusillum* (Miranda, 1924) Baylis, 1927.) In *Amphisbaena* sp. of Brazil.

31. **Aplectana raillieti** Travassos, 1925

(Syn. : *Oxysomatium raillieti* (Travassos, 1925) Baylis, 1927.) In *Amphisbaena alba* of Brazil.

32. **Aplectana rysavyi** Baruš & Coy Otero, 1969

In *Cadea palirostrata* of Cuba.

33. **Aplectana travassosi** (Gomes & Motta, 1967) n. comb.

(Syn. : *Freitasoxyascaris travassosi* Gomes & Motta, 1967.) In *Liophis miliaris* of Brazil.

Type specimens were examined (IOC 19.102b, f) and *Freitasoxyascaris* is synonymized with *Aplectana*.

34. **Aplectana vellardi** Travassos, 1926

(Syn. : *Neyraplectana vellardi* (Travassos, 1926) Ballesteros-Márquez, 1945 ; *Oxysomatium vellardi* (Travassos, 1926) Skrjabin, Schikhobalova & Mozgovoi, 1951.) In *Bufo marinus* of Brazil ; also in *Hylodes miliaris*, *H. guntheri*, *Elosia nasus* of Brazil (Travassos, 1931*b*).

This species is reported herein from *Bufo* sp. of Exu, Brazil (MNHN 263U). *A. vellardi* has one large unpaired papilla on the anterior lip of the anus and a short (12 µm), wide, poorly chitinized gubernaculum not mentioned in the original description.

Species incertae sedis

35. **Aplectana cubana** Baruš, 1972

In *Eleutherodactylus dimidiatus*, *E. cuneatus*, *E. zugi* of Cuba.

Only female worms are known and therefore the species must be left *incertae sedis*. The reproductive tract is apparently typical of *Aplectana*.

36. **Aplectana incerta** Caballero, 1949

(Syn. : *Oxysomatium incertum* (Caballero, 1949) Skrjabin, Schikhobalova & Mozgovoi, 1951.) In *Bufo horribilis* of Mexico.

Females were described as prodelphic and this indicates the species belongs in *Aplectana*. However, the female worms are small (2.9-3.2 mm long, 200-220 µm wide) and the eggs are relatively large (> 100 µm long). *A. incerta* therefore may be a *Raillietnema* sp. and it is left *incertae sedis*.

37. **Aplectana pintoi** Travassos, 1925

(Syn. : *Neyraplectana pintoi* (Travassos, 1925) Ballesteros-Márquez, 1945.) In *Hylodes guntheri* of Brazil.

Females were not described and the species is left *incertae sedis*. Travassos (1931*b*) republished his original description, adding an illustration of the anterior end and a lateral view of the spicules.

Species excluded

38. **Ascaris foecunda** Rudolphi, 1819

(Syn. : *Aplectana foecunda* (Rudolphi, 1819) Yorke & Maplestone, 1926 ; *Oxysomatium foecundus* (Rudolphi, 1819) Skrjabin, Schikhobalova & Mozgovoi, 1951). In *Hyla* sp. and *Rana cornuta* (= *Ceratophrys cornuta*) of Brazil.

The original description of this species does not permit identification. *A. foecunda* is a *species dubia*.

39. **Ascaris unguiculata** Rudolphi, 1819

(Syn. : *Aplectana unguiculata* (Rudolphi, 1819) Miranda, 1924 ; *Oxysomatium unguiculatum* (Rudolphi, 1819) Baylis, 1927.) In *Amphisbaena* sp. of Brazil.

The original description is too brief to permit identification and no illustrations were given. Since there are two distinct *Aplectana* spp. recorded from *Amphisbaena* (*A. pusilla* and *A. raillieti*) it appears that *A. unguiculata* cannot be identified and it is designated a *species dubia*. Worms described by Miranda (1924) under the name *Aplectana unguiculata* Rudolphi are probably conspecific with *A. pusilla*.

40. **Oxyuris dubia** Leidy, 1856

(Syn. : *Aplectana dubia* (Leidy, 1856) Travassos, 1931 ; *Oxysomatium dubia* (Leidy, 1856) Skrjabin, Schikhobalova & Mozgovoi, 1951.) In *Bufo americanus* and *Salamandra rubra* (?) of the United States.

The original description of this species does not permit identification, even to superfamily. *O. dubia* is a *species dubia*.

41. **Aplectana americana** Walton, 1929

(Syn. : *Oxysomatium americanum* (Walton, 1929) Skrjabin, Schikhobalova & Mozgovoi, 1951.)
In *Rana pipiens, R. palustris, R. catesbeiana* of the United States.

One male type specimen of this species (USNM 50765) has been examined. *A. americana* is synonymous with *Cosmocercoides dukae* (Holl, 1928).

42. **Aplectana congolense** Schuurmans Stekhoven, 1937

In the body cavity of *Phrynobatrachus graneri* of the Congo.

A. congolense is known only from three female worms. Type specimens are not available for study and the original description is inadequate. However, one figure shows that the oesophagus is typical of the Family Atractidae. It is designated a *species dubia*.

43. **Aplectana fusiforme** Savazzini, 1928

In *Leptodactylus* sp. of Brazil.

The description of this species is inadequate. An unclear photograph of a male worm indicates the presence of a paired row of large preanal papillae. These are possibly plectanes typical of *Cosmocerca*. *A. fusiforme* is designated a *species dubia*.

44. **Aplectana gigantica** Olsen, 1938

This species was recently transferred to the Kathlaniidae as *Megalobatrachonema gigantica* (Olsen, 1938) Baker, 1980.

45. **Aplectana lynae** Kennedy, 1977

In *Rana aurora* of British Columbia, Canada.

This species has rosette papillae in males and therefore it belongs in the genus *Cosmocercoides*. The species is probably synonymous with *Cosmocercoides dukae* (Holl, 1928) which is widely distributed in North America and has been reported in *R. aurora* of California.

46. **Aplectana mauritanica** López-Neyra, 1947

In *Rana esculenta* of Spain.

A. mauritanicus is known from a single male worm which is not available for study. An illustration of the male caudal end is most similar to *Orneoascaris numidicum* (Seurat,

1917) (= *Amplicaecum numidicum*) (Ascarididae) known from European and North African anurans. These species are probably synonymous. *A. mauritanicus* is designated a *species dubia*.

47. **Aplectana uropeltidarum** Crusz & Ching, 1975

This species was recently reclassified as *Cosmocercella uropeltidarum* (Crusz & Ching, 1975) Baker & Crusz, 1980.

KEY TO *Aplectana* SPECIES
(Species of doubtful status have been excluded.)

1-(20) Caudal papillae numerous and small, not readily distinguished from the somatic papillae.
2-(3) Proximal third of spicules separated from distal portion by a constriction. *A. vellardi*
3-(2) Spicule shaft tubular between extremities.
4-(9) Tail of male divided into distinct thick proximal portion and spike-like distal portion. Distal end of spicule bluntly pointed.
5-(6) Spicules short, weakly developed, tapering gradually from wide capitulum to blunt distal end ..... *A. delirae* (? = *A. crossodactyli*)
6-(5) Spicules well developed, with thick-walled shaft.
7-(8) Wide lateral alae (30 µm) near posterior end, lacking markedly large, unpaired preanal papilla. ..... *A. chilensis*
8-(7) Lateral alae narrow near posterior end, with markedly large unpaired digitiform preanal papilla..... *A. meridionalis*
9-(4) Tail of male not divided into thick and thin portion.
Distal end of spicules sharply pointed.
10-(15) Tail of male slender throughout its length.
11-(12) Distal half of male tail with few papillae..... *A. crucifer*
12-(11) Distal half of male tail with numerous (> 5 pairs) papillae.
13-(14) Oesophagus markedly long in females (> 900 µm), slender and with a markedly small bulb.
Caudal papillae regularly distributed in pairs..... *A. vercammeni*
14-(13) Oesophagus in females relatively short (< 725 µm) and robust, with large bulb.
Caudal papillae irregularly distributed on tail, not all occurring as pairs. *A. macintoshii*
15-(10) Tail of male relatively thick, tapering gradually to pointed distal end.
16-(17) Gubernaculum inconspicuous..... *A. papillifera*
17-(16) Gubernaculum well chitinized.
18-(19) Male tail relatively short (155 µm)..... *A. lopesi*
19-(18) Male tail relatively long (240-325 µm)..... *A. acuminata*
20-(1) Caudal papillae not numerous on tail, distinguished by their size from the smaller somatic papillae.
21-(22) Spicules relatively wide (280 µm long, 30 µm wide)..... *A. raillieti*
22-(21) Spicules not markedly wide.
23-(24) Male tail thick and bluntly pointed, with elongate, strongly chitinized spicules and large irregularly distributed caudal papillae..... *A. rysavyi*
24-(23) Male tail conical and sharply pointed.

25-(26) Spicules inconspicuous, markedly short and wide..... *A. praeputialis*
26-(25) Spicules conspicuous. markedly longer than wide.
27-(38) Spicules sharply pointed.
28-(29) Posterior half of female tail with markedly thick body cuticle..... *A. leesi*
29-(28) Body cuticle on female tail not markedly thick.
30-(31) Spicules markedly short (100 μm)..... *A. micropenis*
31-(30) Spicules not markedly short (100 μm).
32-(33) Spicules markedly long (450 μm) ..... *A. mexicanum*
33-(32) Spicules less than 350 μm long.
34-(35) Male tail conical, tapering gradually to distal point..... *A. travassosi*
35-(34) Male tail with elongate, filament-like distal point.
36-(37) Male with six pairs of large preanal papillae..... *A. ranae*
37-(36) Male with five pairs of large preanal papillae..... *A. longicaudatum*
38-(27) Spicules with modified distal extremity.
39-(46) Distal end of spicules in form of an apical depression or divided into two projections.
40-(41) Distal end of spicules in form of an apical depression..... *A. linstowi*
41-(40) Distal end of spicules divided into two projections.
42-(43) Distal projections of spicules unequal, bluntly pointed, surrounded by a membranous sheath. *A. hamatospicula*
43-(42) Distal projections of spicules equal, sharply pointed, not surrounded by a membranous sheath.
44-(45) Spicules < 225 μm and gubernaculum 71 μm long in males 2.0-2.5 mm long..... *A. membranosa*
45-(44) Spicules 110 μm and gubernaculum 49 μm long in males 2.0 mm long.... *A. pusilla*
46-(39) Distal end of shaft of spicules sharply pointed, with alate or membranous structures attached.
47-(50) Distal end of spicules with two alate structures on opposite sides of spicule shaft.
48-(49) Alate structure equal..... *A. brumpti*
49-(48) Alate structures unequal..... *A. brygooi* n. sp.
50-(47) Distal end of spicules with membranous structures not alate in form.
51-(54) Membranous sheath forming clear vesicle around distal 50 μm of spicule shaft and extending slightly beyond the terminal end of the shaft.
52-(53) 5 pairs of preanal caudal papillae present in males..... *A. itzocanensis*
53-(52) 9-12 pairs of preanal caudal papillae present in males..... *A. hoffmani*
54-(51) Membranous structure forming clear vesicle beyond distal end of the spicule shaft.
55-(56) One large sublateral pair of preanal caudal papillae present in addition to 2 rows of subventral preanal papillae in males..... *A. pudenda*
56-(55) Preanal caudal papillae all occurring in 2 subventral rows.
57-(58) Posterior border of anus with bilobed mamelon-like protuberance..... *A. courdurieri*
58-(57) Posterior border of anus lacking mamelon-like protuberance.
59-(60) Tail of male with two pairs of adjacent postanal papillae close to anus. *A. chamaeleonis*
60-(59) Two pairs of adjacent postanal papillae in mid-region of tail of male.
61-(62) Anterior lip of anus in males with one unpaired and three pairs of papillae..... *A. hylambatis*
62-(61) Anterior lip of anus in males with one unpaired and one pair of papillae..... *A. bonariensis*

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